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VOL. XXI. NO. 5

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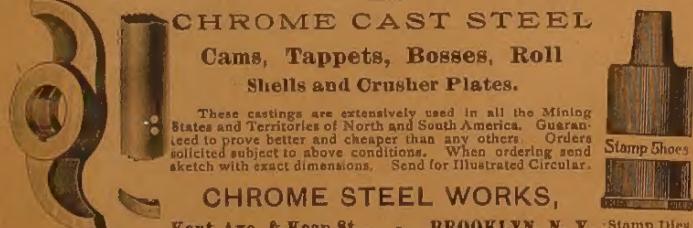
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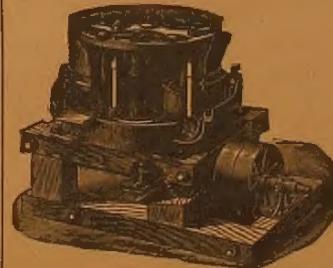
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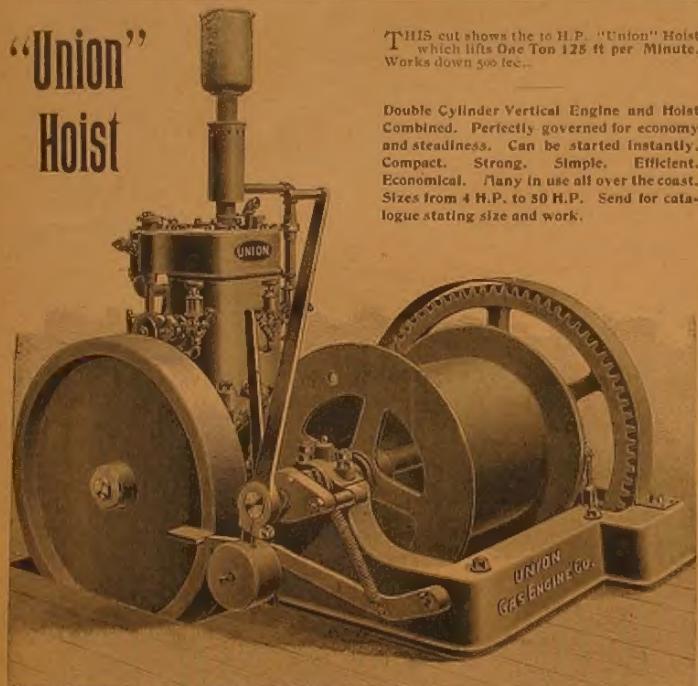
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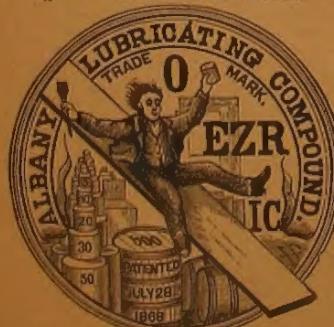
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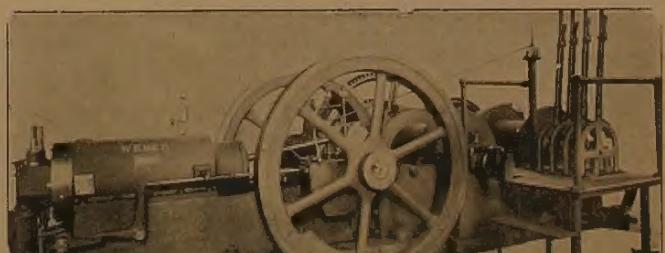
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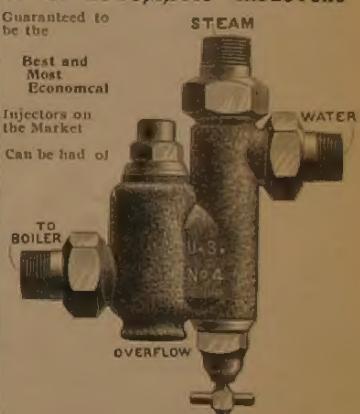
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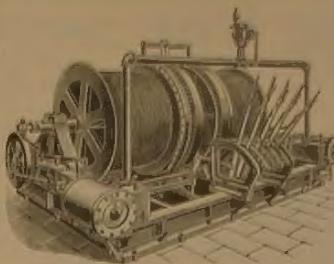
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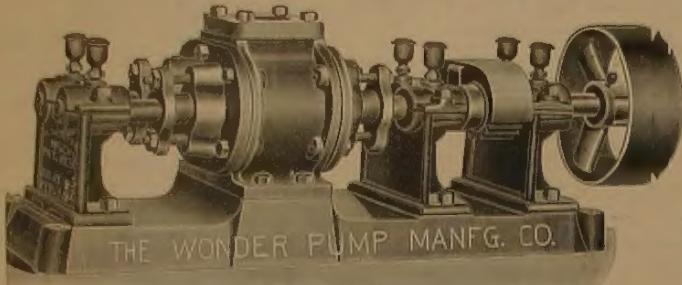
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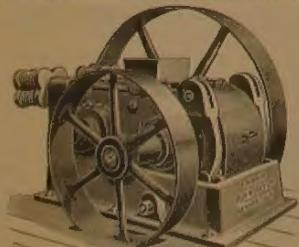
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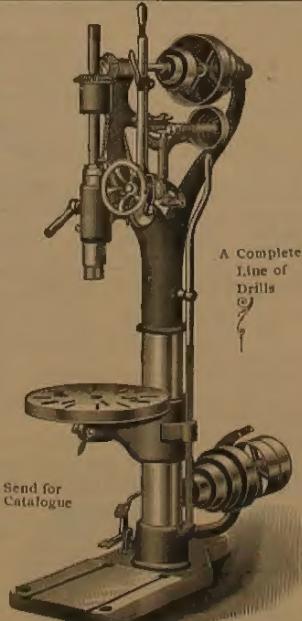
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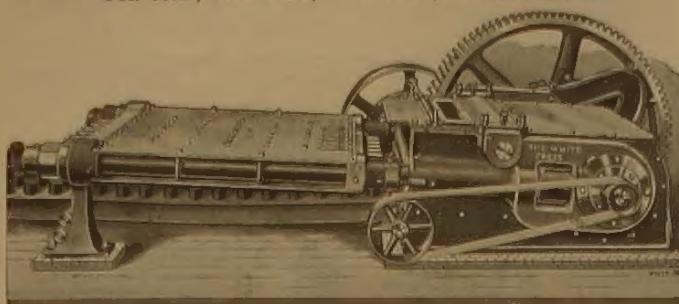
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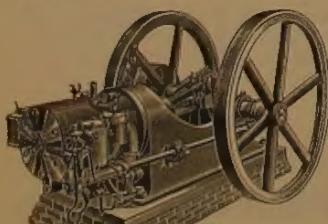
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ISSUED SEMI-MONTHLY

ADVERTISING RATES FURNISHED ON APPLICATION.

THE CALIFORNIA MINERS' ASSOCIATION.

The invitations extended to the miners in the southern counties, printed in our last issue, to become members of the Southern California Branch of this influential and useful organization, has met with hearty response from all directions, and the membership list is rapidly increasing in consequence. As intimated formerly, the forthcoming meeting of the American Institute of Mining Engineers is to be held in San Francisco in October next, when they are to be received as the guests of the California Miners' Association. This always interesting gathering of the best talent in the mining world, offers a special inducement to the mining men of the Southern counties to enroll their names as members with the secretary pro tem until his successor is nominated, O. S. Breese, Room 420 Stimson Block, Los Angeles. The entrance fee is two dollars, which entitles them to membership and privileges for one year. All those interested in the several branches of the industry are invited to become members, and further the importance of mining in this section, as well as their own personal interests and duty in doing so.

THE BAKER-CLARK GOLD PROCESS.

The Baker-Clark gold extraction process for which a patent has been applied for by Deadwood, South Dakota, parties, of whom W. H. Baker is the inventor and J. T. Gillmore is interested. The process is only in the experimental stage so far, and is outlined as intended to dissolve the gold and silver in ores by the use of boiling hot alkaline and cyanide of potassium solutions under pressure, and recovering an equivalent of the metals from the solution by the same energy at the same moment, without the use of zinc or other precipitating agencies. A weekly newspaper of Deadwood in which the process is described says:

"To carry the process into effect the ore is

finely pulverized and run into vats. These vats are made of wrought iron and are six feet long and two feet high, oval at the bottom and fitted with perforated pipes that run lengthwise. The vats are filled half full of pulp, and a cubic foot of solution is added for every three cubic feet of pulp. The mechanical stirring apparatus, calculated to keep the solution agitated, is then applied, the steam from the boilers is turned on, and the boiling and agitation are continued for three hours. The evaporation by that time nearly reaches the amount of solution added to the vats, but the inventor manages to keep the solution of uniform strength, which is a very important item.

"After three hours' agitation the vats are detached, pushed out of the way, and another set of vats is taken up. The solutions from the first set are drawn off and returned to the tanks, where it is allowed to settle, the solutions being returned to the boilers. The tailings are dumped into bins, water is added, and, to equal the amount of solution drawn off, steam from the boilers is applied, and the agitation is kept up for nine hours. The solution is then drawn off, wash water is added and drawn off, and these, containing the gold and silver recovered from the tailings, are added to fresh pulp. Cyanide of potassium is added until the solution contains from seven to ten pounds of free cyanide to every 2,000 pounds of the solution, which makes it ready for use on the fresh pulp. The values in the solutions, added to the amount recovered in three hours' treatment and drawn off, equal the full values recovered in the pulp, and average about 80 per cent of the values in the ore treated.

"When the solutions in the boilers become heavily charged with the metals they are evaporated to complete dryness, the residue fused at a red heat, then allowed to cool; the saline mass is dissolved with water and the gold and silver are recovered in a metallic porous state. The water may contain a little gold and silver, and is added to fresh pulp, for further treatment.

"By actual tests, conducted in Deadwood, over 90 per cent of the values have been obtained by the process. In one experiment Mr. Baker recovered 94 per cent of the fine assay."

As no estimate of the fuel used in proportion to the ton of ore treated by the process is given, it is not shown if the cost of fuel exceeded the amount of gold obtained. The cost of fuel is an important item in such a process.

TRADE UNIONS.

In these days when capital and labor are each organizing into trusts, combines and syndicates, or unions, societies and associations, (for it matters not under what names they are called) for the mutual benefit of the members joining such social or trade organizations we find trouble emanating. The right to do so is one of individual choice or duty, when the members so combined unite to regulate their own actions and operations, but when any class or society attempts to control the liberty of any individual outside of their own organization, they are taking to themselves power which only belongs to the legally elected representatives of the people, and are therefore doing that which is illegal in attempting to force an outside party to do certain acts against his will. The recent labor trouble and destruction of property, by the union miners at the Bunker

Hill and Sullivan mines in Idaho, which was given in detail in the daily press, is a case in point. It must be remembered, however, that it was capital that was the first to combine, and that caused or in a measure forced the labor element to do so likewise. The miners' union has, however, carried lawless actions and disorder into almost every district in which it has made its appearance. The chief object of such a union is claimed to be the protection of the rights of its individual members, which is a good object; but the first actions seem always to be the illegal one of seeking to control the liberty of those outside and differing from them, and, failing in that point, they resort to physical force and the destruction of life and property. Riot, bloodshed and fire have been proved by history to follow as a result the misunderstood object of union and ill-advised counsel on the part of the leaders.

The loss to a district or state where such trouble arises cannot be estimated at the amount of property destroyed or lives lost, for there is no more sure way to prevent the future investment of capital than to let it be known that the miners' union is in force, and attempts to dictate terms to the owners and their non-union fellow workmen. By such lawless actions, the labor element which contains the largest number suffers the greatest loss, for their own actions strike back with greatest force and effect against themselves.

MINING CLAIM SIDE LINES.

"British Columbia, it appears, has had just enough experience with the American extra-lateral right law to raise some very nice legal problems, which are heightened by the complex geological features of that region," so says the *Mining and Scientific Press* of 6th ult.

The facts of the case are that the legislators of British Columbia were wrongly induced a few years ago, by a minority of the miners of the country, to change the law in respect to the side line boundaries of mining claims from the just principle to the miner and to capital invested in mines, of following the dip of the vein or deposit, to the unjust side line of surface boundary, embraced in the square location, with vertical side lines for all boundaries of the claim.

As the majority of the veins or deposits in British Columbia, or any other country, do not dip in a vertical direction, the farmers' square location and vertical side line boundaries are proving a delusion and a snare, for, after the mine is opened, it is discovered that it dips under an adjoining claim owned by another party. They must either quit work or buy that party out. This is where the trouble arises of applying surface laws and customs to underground or geologic conditions which are not made on the vertical plan—descending from heaven to the center of the earth.

As it is mineral the miner and capital are after, the best and fairest boundary is the just and sensible Western American plan, of following the dip of the same vein or deposit, in the interest of capital invested in deep mining. To stop a mine from being operated when the vein and the workings reach an imaginary surface line, is to impose an unjust restriction on the industry.

British Columbia is suffering from an epidemic of two much dip under an unjust boundary, as the result of having departed from a just American custom. There are a few inexperienced theorists who desire to impose on

the American mining industry the same hindrance to deep mining and injustice to capital as has been practiced in British Columbia, because unsuitable laws and surface conditions do not apply to geological and underground work. Keep legal problems away from geological conditions, and arbitration among mining men will settle all mining disputes better than lawyers in courts of law, whose interest is to carry on the fight.

WIND AS A MOTIVE POWER.

During the last century, the advance made in obtaining power made from the agency of the wind has not kept pace with steam or electricity. Before the advent of coal mining and the steam engine, the windmill was the chief source of mechanical power in many parts of the world. With the exception of the large and efficient use to which compressed air is put, the windmills of today are hardly a step in advance of a hundred years ago, except in the use of iron or steel in their construction in place of wood; in some instances they are seldom more efficient. In the arid sections of the southwest, where water and fuel are scarce, this source of possible power supply offers a large field for the inventive genius in pneumatic machines of all kinds. The application of the windmill to compressing air, or generating electricity for power, heat or light, should be a sufficient field to bring forth more effective machinery of that description. In the mountain and desert sections, there is great necessity for such improved machinery.

If the same energy was employed in inventing a better windmill that is wasted on flying machines, it might accomplish some good purpose. The use and cheapened production of aluminum, especially in the form of sheets, ought to make a light and durable material in the construction of such a class of machinery and give it a larger industrial application.

It has been found that a windmill and dynamo storage battery plant, for the generation and storage of electricity for household use, costs in the neighborhood of \$4,000, which places it beyond the means of the large majority of those who live outside a town or city and require such a plant. With a cheap and powerful windmill and plant for producing heat and light, which has not as yet been introduced, the winds of winter could be turned to the useful purpose of comfort, which high cost makes impossible. With efficient means of getting power from this source, there are large districts where mines could be operated at a profit. There is no branch of the mechanical industry which has been so much neglected, and which offers such good inducements as this subject presents, and in which there is such a large market ready to purchase the plant, when produced at a cost low enough to be within the reach of those of limited means.

POWER FOR UNDERGROUND WORK.

A few years ago steam was the chief means of obtaining power for underground work, but the loss of power by condensation was so great, that the introduction of compressed air and electricity soon made its use the most expensive. Steam had the great objection that it increased the temperature and moisture of the air in the mine, and affected the health of the miners where it was used. Compressed air and electricity have succeeded it, and are equal competitors for favor, with the advant-

age in favor of compressed air, as it purifies the air of the mine and cools it to a small extent. As the mine increases in size and in depth, so does the necessity arise for power for underground work and increased supply of fresh air, which compressed air yields. Another advantage possessed by it is, that about the same amount of pressure is obtained from it underground, as there is indicated at the air receiver on the surface. In a northern climate where the atmosphere is moist and damp, that moisture is not eliminated from it by the heat produced in the act of compressing it, but to diminish that moisture, it is admirable to pass the air pipe leading from the compressor to the air receiver so as to go through the back part of the fire box under the boilers, when steam is the power used. By doing so, the air is deprived of most of its moisture, and the heat from the fire box also adds to the effect of compressing, in expanding the volume. It also has the benefit of making the air so much drier, that the amount of ice formed in liberating it at the drill, or cylinder of the pump or engine, is decreased so as at times to lessen the necessity of keeping a torch burning at that part to keep it from freezing up.

The discoveries of Professor Dewar and others in the direction of the higher compression and formation of liquefied air, may not yield all the seemingly impossible claims of economy and increase in the manufacture of it which some claim, but with cheap cost of producing, it will have an important effect on mining operations in future.

Electric transmission of power, where water is used to obtain that power, has the great advantage of being used for hoisting purposes, as well as heating and lighting, and the line is easily constructed and takes up very little space underground in narrow workings. As experience is gained, time will decrease the cost of this class of machinery, as the whole tendency is to make deep mining less expensive.

GOLD FINDS.

The marvelous has ever been attractive to mankind in all ages and countries, and of notable things there are some things of an unnatural or unusual character that find believers. There are but few persons compared with the many, who have not been imposed on through their credulity. When in the line of their interests people are easily led to believe what is contrary to the ordinary laws of nature and of common experience.

Nothing of a material character has been so exaggerated as the richness of gold discoveries, and people generally are disposed to regard every new report as veritable. If all the gold finds which have been reported within the last few years had turned out to be one-tenth as rich as at first represented, the great want today would have been for storage room for gold products. Indeed, gold would have become so abundant that long ago the Rothschilds and their satellites would have had it demonetized. To have had the usual percentage coined would have made money too plentiful and cheap to suit the views of the money changers.

In pursuit of deposits of the precious metals, gold in particular, the imagination is apt to outrun the judgment. It has been so always, and it is presumable that it will continue to be so, and disappointments without number do not seem to create an equipoise of the two elements of the human mind. Gold bears a conspicuous place in nations of which

there is any authentic history, and has been a stimulant to more reckless and persistent energy than any other material object.

Created gold has a limit, and, so far as known, the process of creation has been in disuse and idle since the first preserved record of man's existence was made. The gold fields of Ophir, Ormuz and of all Asia and Europe have been practically exhausted. Those of the Americas have been largely exploited and many of them have been abandoned. With the energy, science and skill now employed in extracting gold from the earth, it cannot be long before all that is practicable attainable will have been procured. It is true there are fields that have not yet been thoroughly explored but they are comparatively limited in area, and there will be new finds repeatedly promulgated with the usual exaggerations.

Of all the gold produced from the earliest historical date, but \$4,000,000,000 exist in coin and bullion devoted to monetary uses, according to accredited statisticians. How much there is in ornaments and otherwise no statistician seems to have undertaken to find out. Its consumption is immense in the arts and manufactures, dentistry alone consuming a large quantity, and much is lost through wear, on land and in the sea.

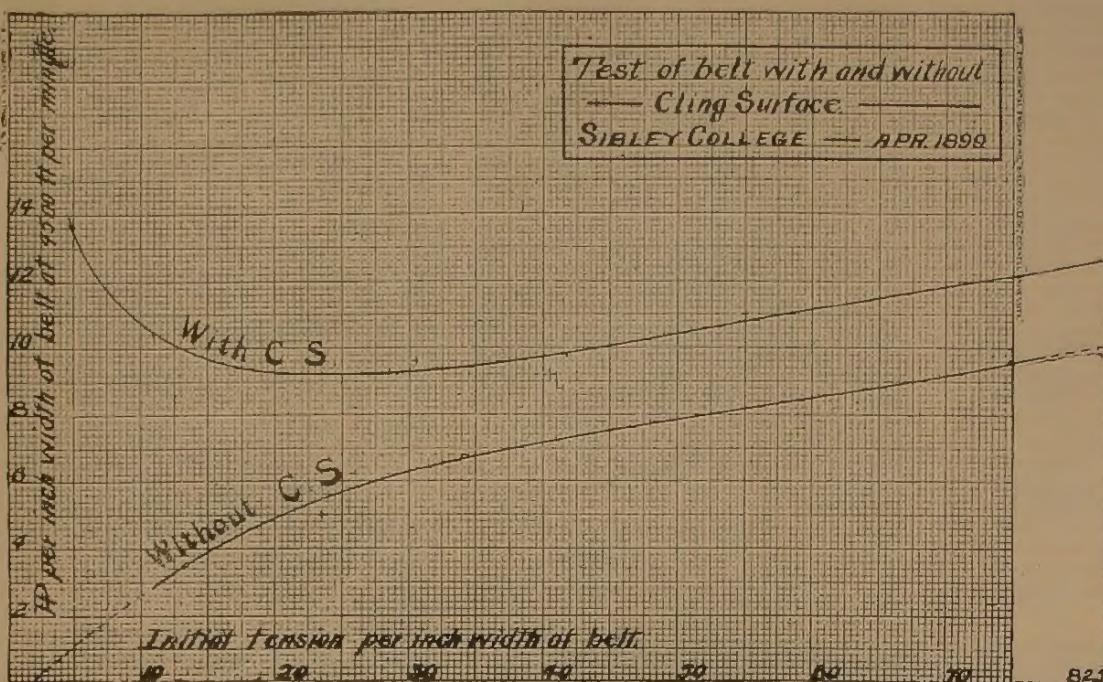
As a high value is put upon gold and maintained by coinage laws and the compulsion placed upon the Bank of England by act of Parliament, to purchase all gold offered to it at a price closely corresponding to its coinage value, relieves it from the fluctuations attending every other commodity, and clothes it with unusual attractiveness, and causes pursuit of it with restless and persistent energy. It will hold sway over all other commodities so long as the exclusive privileges conferred upon it enable it to yield a margin above the cost of production. And so long as this continues there will be finds of imaginary richness, and people will believe what is reported and be victimized through their credulity.

The same energy would be displayed in silver mining were silver given the same privileges as are accorded to gold in mintage. Silver is put to larger uses in the arts and manufactures than gold, but it exists in larger quantities, and for that reason bears a less price through the operation of the law of supply and demand. Being of less value and not so highly esteemed, reports of rich discoveries are not so exciting.

Very particular engineers, annoyed by using oil for lubricating purposes will find a welcome change in the engine room if they apply Albany Grease, and will send to Adam Cook's Sons, 313 West street, New York, for a sample can and try it on the crank pins of the engine or engines in use. The firm make a standing offer to furnish a sufficient quantity of their compound and an Albany Grease Cup free of charge or expense to all engineers who desire to test the matter. Aside from the extra cleanliness obtained in the use of this standard lubricant, the saving in dollars and cents in the oil bill is a substantial one, and well worthy of investigation.

The Allis Co. have received an order for a twenty-stamp mill complete from T. F. Walsh, through their Denver Agency, to be built in Ouray, Colo.

This Company has also received an order for a ten-stamp mill, with concentrators, from the Fisher Creek Mining Co., which will be built in Libby Creek district, Montana.

**A TEST ON CLING-SURFACE.**

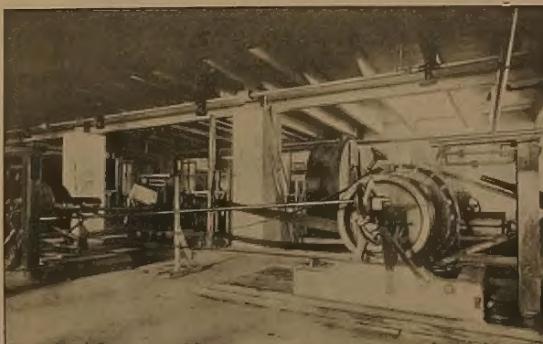
Sibley College, Cornell University,
Department Experimental Engineering.
R. C. CARPENTER, Chief

Ithaca, N. Y. April 17, '99.
Cling-Surface Mfg. Co., Buffalo, N. Y.

DEAR SIR:—I beg leave to report that the Laboratory force of Sibley College have, under my directions tested the effect of applying Cling-Surface to belting.

The tests were made in every case on the belt testing machine owned by Sibley College; this is constructed so that the belt can be tested under ordinary running conditions and measurements can be made for determining the power supplied, the power delivered, the tension on the belt, the arc of contact on either pulley and the slip. This machine has been used in extensive investigations for determining the efficiency of belting and is described in Vol. XV. Transactions American Society of Mechanical Engineers. Three belts have been tested each before and after treating with Cling-Surface and each under various conditions of loading. In tests made a considerable number of observations have been repeated in order to check the accuracy of the results.

The belts before testing were in every case clean and in good condition and running under rather better than average conditions. The Cling-Surface was applied on several successive days and in small quantities in accordance with the directions supplied by the manufacturers before commencing the test. The material was almost wholly absorbed at the time of starting the test, and none has since been

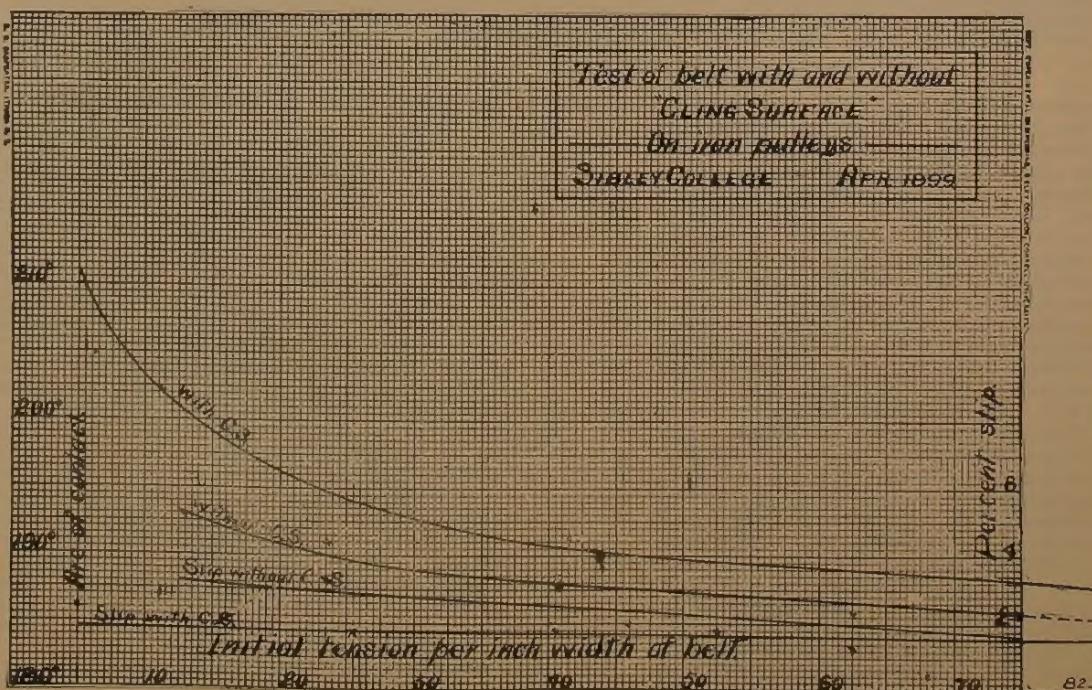


BELT TESTING MACHINE, SIBLEY COLLEGE, CORNELL UNIVERSITY.

applied. The material made the belt soft and pliable and gave it an inner surface somewhat resembling patent leather. The surface was only in the least degree sticky to the touch.

The general results of the tests with Cling-Surface show an increased transmitting power as compared with the same belt in an untreated condition; it also shows an increased arc of contact, and very much less slip. It shows a very high transmitting power when the belt is run extremely loose or with very little tension on the pulleys, the reverse of which is true with the untreated belt. It is shown by the report that the greatest transmission capacity for the belt treated with Cling-Surface was found when there was the least possible tension on the belt and when the belt was running so slack that the sides nearly touched. It will be noted also that as the tension of the belt was increased the transmitting capacity diminished until a tension of about 20 pounds per inch of width of belt was reached, after which the transmitting capacity commenced to increase and from that point continued to increase with increase of tension.

In the test of the same belt not treated with Cling-Surface the results were quite different inasmuch as the capacity with very light tensions was practically nothing and the capacity increased as the tension increased; at no point, however, did the untreated belt have even approximately the same capacity as the treated belt with the same tension, and



moreover the treated belt transmitted much more power with a very light tension than the untreated belt with a heavy tension. The test with the belts treated and untreated running on wooden pulleys showed essentially the same characteristics. The general effect of the Cling-Surface appears to enable the belt to transmit a power equal to its entire capacity without producing heavy stresses on the driving boxes of the pulleys, or in other words it doubles the full capacity of the belt to be obtained for transmitting power when the belt is so loose that the sides nearly touch.

The general results of the tests of the untreated and treated belts when running on iron pulleys is shown in the accompanying diagrams. In upper diagram the horizontal distances show the tension on the belt in pounds per inch of width, the vertical distances show the horse power transmitted per inch of width of belt for a speed of 4500 ft. per minute. The lower line represents the results obtained with the untreated belt; the upper line the results obtained with the treated belt. It will be noted that the lower line continually rises, showing an increase in capacity with an increase in tension; the upper line decends at first, showing a decrease in

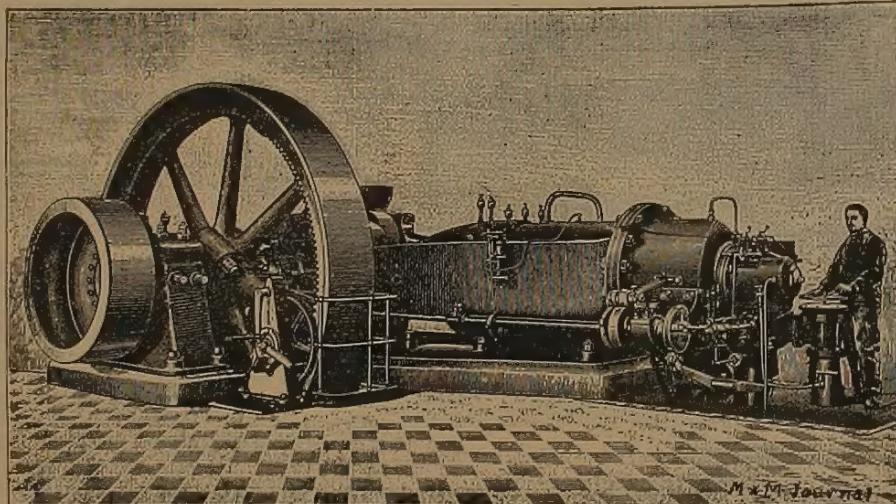
transmitting power which is greater than that produced by the increase of pressure due to the increased tension on the belt. With the untreated belt such change is very slight, and consequently a falling off in carrying capacity for light tension takes place.

In regard to the question raised as to the preservative qualities of Cling-Surface and to the permanency of the effect produced by its application the writer would say that our tests have of necessity been of too short duration to give conclusive answers. The general effect of the Cling-Surface is to soften the belt and to put it apparently in the best condition for transmitting power and retaining its good qualities. The surface produced by the Cling-Surface remains apparently unchanged after several weeks of use, and the inference to be drawn is that the material has an effect which continues permanent for some time at least.

A fuller report containing the complete data of all the tests will be sent to you as soon as the entire results obtained have been computed.

Very respectfully,

R. C. CARPENTER,
Prof. of Experimental Engineering.



GAS ENGINE USING BLAST FURNACE GASES.

capacity with increase in tension, and later rises. In no place does the transmitting capacity of the treated belt fall below that of the untreated belt. In comparing the respective results it will be noted that the treated belt has a carrying capacity of 15.8 horse power when the tension per inch of width is 5 pounds, while for the same conditions the untreated belt has no carrying capacity; furthermore, it is noted that the carrying capacity of the treated belt even at this low tension, is nearly 40 per cent higher than that of the untreated belt even when the tension has been increased to 60 pounds per inch of width of belt. The lower plate shows the arc of contact and the maximum percentage of slip for belts run both in the treated and untreated condition with different tensions and iron pulleys. From this it is seen that the slip of a treated belt is much less and the arc of contact greater for a given total tension than with the untreated belt.

The falling off in carrying capacity with increase of belt tension for treated belt is doubtless due to the rapid change in the arc of contact, which diminishes with increase of tension. This causes a diminution in the

UTILITY OF BLAST FURNACE GAS.

In our issue of November 1st and November 15th, 1898, we published articles on Blast Furnace Gas and the uses to which this gas could be put.

Efforts to use this gas date back only a few years, but is at the same time attracting much attention of scientists and owners of blast furnaces. It was first used for fuel under steam boilers, but experiments with small gas engines showed the possibility of running large gas engines with a capacity equal to that of steam engines. When a blast furnace is run in connection with a mine producing iron ore, the gas could be made to generate power to run an air compressor, thereby operating the compressed air drills in the mine, as well as furnishing power to the hoisting machinery to deliver ore to surface.

In foreign countries this economical use of a formerly wasted by-product in smelting iron ore has been adopted on a larger scale than is at present noticeable in the United States.

In France blast furnace gases are becoming more generally understood, and recent experiments, carried on by noted authorities on

the subject, have brought out numerous important items of interest and special features in gas engines. The experiments of Mr. Witz, as described in *L'Eclairage Electrique*, are of interest, and the figures given by him furnish a good insight to the enormous waste of this gas at the present time:

"A hundred ton furnace, for instance, wastes about 2000 h. p. in the gases, part of which is used for auxiliary machinery, leaving, however, an enormous amount which is absolutely wasted and could be utilized. Furnaces of 150 to 200 tons capacity are not rare, there being one in America using even 700 tons every 24 hours, in which the material for combustion is reduced to three-quarters of a ton per ton of iron. A thermic balance sheet is given in which the heat units for 24 hours have been worked out, which shows that the charge of about 92,000 kg. of coke contains 629 million heat units, to this must be added 416 million which is recovered from the re-heaters, making a total of 1045 million. That consumed by the chemical reactions in the furnace amount to 182 million; that utilized for re-heating 473 million; that utilized for the production of steam 50 million, leaving 340 million calories, or over half that in the coke, as wasted energy escaping with the gases. The portion which develops steam for the engines is utilized very uneconomically at the rate of at least 22 cu. m. of gas per indicated h. p. hour, which is at the rate of only about 3 per cent efficiency. With the aid of gas engines only about 3.5 cu. m. of these gases is required per h. p. hour, and at this rate, if the gases now used in the boilers are consumed in gas engines instead, the horse power obtained would be 2381, instead of 380, as at present with steam engines. This would involve the use of very large gas engines, which have heretofore been considered impracticable, but they are now being built for 200 and even 500 h. p., the latter with double cylinders being readily increased to 1000 h. p. An engine for 180 h. p. at 87 per cent ignitions is shown in the adjoining illustration, which will give idea of the size.

The diameter is 800 mm., the stroke one meter and the speek 105 revolutions; it appears that there is one ignition for every four movements of the piston. It has run continuously for 120 hours without a single premature ignition. The tests made were made by that writer himself, who is an authority. It is proposed to use the remaining 1900 h. p. from a hundred ton furnace to operate the dynamos of a central station for distributing the power. A group of such furnaces is therefore quite as valuable a source of power as a large waterfall. It is even argued that when these gases are utilized the iron produced by the furnaces may be considered as a mere by-product.

The greatly extended use of compressed air appliances has created a positive demand for efficiency and maximum economy in the design and construction of air compressing machinery, among the manufacturers of which the Clayton Air Compressor Works, with offices at 26 Cortland street, New York City, N. Y., rank with the first. This company have recently issued their Catalogue, No. 10, containing seventy pages, and printed on heavy callendered half-tone paper. The catalogue contains much useful information regarding air compressors, together with numerous tables as to the transmission and capacity of air pressures lost by air compressors in operation at different altitudes above sea level.

ANTHRACITE COAL IN PERU.

(By WILLIAM GRIFFITH, C. E., SCRANTON, PA.)
(Continued from our issue of May 15th, 1899.)

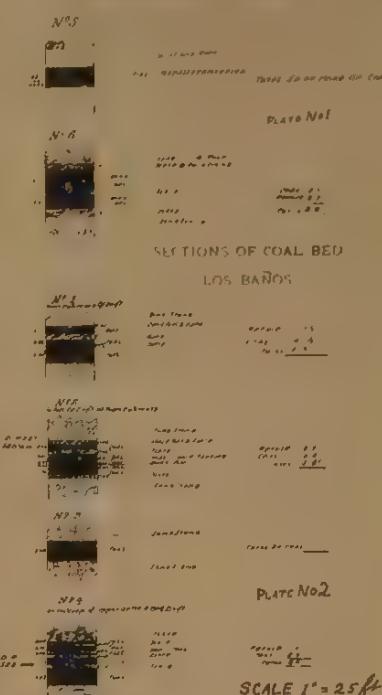
COAL FIELDS.

The formation containing the coal beds which occur in this territory is the one described above as a light gray altered sandstone, to be found 1,000 or 2,000 feet under the limestone referred to before. We would therefore expect to find outcrops of coal where the anticlinal or saddles are of sufficient prominence to raise this formation to the surface, and the coal beds to be in condition for economical mining where the volcanic action was so slight that the stratification is not too much distorted or broken, thus allowing the coal beds to exist in a normal condition, free from the faulting and crushing which would result from fierce volcanic disturbance.

There were two principal regions examined. The one which we shall, for the purposes of this paper, call the Northern or Tuco Field, is located in the northern part of the Department of Cajamarca, about fifty miles north of the ancient Inca city of the same name. The other, about 100 miles south of the first, in the Department of Libertad, which we will denominate the Southern or Chicanus Field. To reach the northern field we start from the port of Pacasmayo, on the Pacific Coast, with half a dozen saddle mules and a dozen pack donkeys laden with our provisions, tents, tools, etc., and travel inland about 100 miles, ascending and crossing the Andean plateau and continental divide at an elevation of 13,000 feet to the town of Hualgayoc, which is located in the bottom of a deep valley about six miles to the eastward of the crest of the divide. This town, an ancient and curious one, is the center of a large silver mining region, and the valley is watered by a small mountain torrent flowing eventually to the Amazon, and is enclosed on one side by a high, precipitous mountain of beautifully stratified limestone of recent age, containing numerous fossil oyster or other recent shells. The eastward dipping outcrop of this limestone was crossed by the trail several miles before the summit of the divide was reached. The other side of the valley is formed by two large mountains of trachyte, which compose part of an immense upheaval or dike of volcanic rock which extends 20 or 30 miles and forms the Hualgayoc mineral belt, from

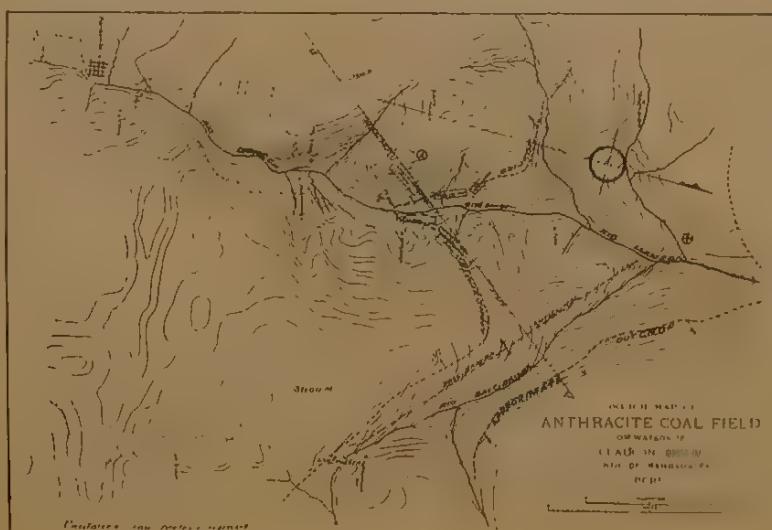
which silver, copper and other metals have been mined for years by the present inhabitants and their ancestors of the Inca race. From Hualgayoc, we traveled northward down the valley of the stream, which soon unites with Rio Llaucon, a branch of the Maranon, which latter forms the source of the main trunk of the Amazon River system. We continue down the Llaucon for about 30 miles, the main trail leading now along the bottom of the narrow valley, and now winding over or round the precipitous mountain ledge. After leaving the igneous rocks of Hualgayoc, our journey lies almost the whole distance over the recent limestone formation previously mentioned, which dips southwestward at an inclination of about 25° , and is evidently of enormous thickness. We, however, eventually, pass below it and our route extends over several miles of the red and buff shales and gray sandstone with an occasional seam of black fire-clay or slate, all dipping southwestward conformably with the limestone. We now find ourselves high on the precipitous mountain side above the river, and we descend by a steep and dangerous trail about 3,000 feet to the bottom of the valley. While passing down we note that the mountain sides are now composed of a fine grain light gray altered sandstone or quartzite, very hard and very regularly stratified, all dipping about 22° southwesterly. It is near the base of this mountain, about 600 feet above the stream, that we find exposed in the cliffs three beds of fine anthracite coal. This locality is known locally as Los Banos, on account of the warm or hot alum springs which are found at the base of the mountain, formerly doubtless used as a bathing spring. The coal beds are about 50 feet apart, and are respectively $5\frac{1}{2}$, 3 and $6\frac{1}{2}$ feet in thickness, having about the same proportion of slate and interstratified refuse as is common in our Pennsylvania anthracite. The sections of these seams, as measured in some old openings cut in the seam years ago, which are still accessible, are shown on the Plate No. 2. Other exposures were subsequently noted in the cliffs across the river, a mile distant, which were also measured and are represented in Plate No. 1. They are doubtless continuations of the same beds. The coal can only be seen where naturally exposed in the nearly vertical cliffs or washouts along the stream, since the tropical foliage is very dense, and no attempt at prospecting has ever been made. An examination of the topography

SECTIONS OF TWO COAL BEDS ON EAST SIDE OF RIO AUCUMA



and geology of the vicinity resulted in the following facts:

About two miles further down the Llaucon River, another stream, known as the Balcibamba, unites with it, flowing in from the southeastward through a deep valley. The mountains on each side of these two valleys are formed by the thick sandstones of the coal measures, causing high, precipitous cliffs. All the measures to the southward are noted to dip to the southwest, while those forming the northward side of the Balcibamba Valley dip to the northeast, thus closing the fact that the valley of the Balcibamba now follows the axis of an immense anticlinal, the crest of which has been eroded so that the bottom of the valley is now composed of a series of softer red and buff shales and broken sandstone which underlie the quartzite containing the coal. While these coal-bearing sandstones on either side of the anticlinals seem to be very regularly disposed as to strike, dip, stratification, and not much disturbed by volcanic influences, the softer measures underlying them along the anticlinal appear to be disrupted, upturned and much more contorted, which would seem to point to the anticlinal valley of the Balcibamba as the center line of greatest disturbance in this immediate vicinity. Standing on a prominence in the valley, the beautifully stratified and regularly dipping rocks of the coal measures may be seen forming the cliffs and mountain tops as far as the eye can reach on either side. We followed the trail leading up the valley of the Balcibamba for 15 miles or thereabout, passing eventually above the sandstone of the coal measures to the rocks of the overlying limestone. Other exposures of coal were noted along the trail; those near to the center of the anticlinal being much disrupted and crushed, while those located further away from the line of disturbance were in much better condition, the coal apparently being of good quality and the bed regular. It must be evident that if these coal beds are as continuous in the measures of the Andes Mountains as coal seams usually are in other



parts of the world, that here is a vast coal field with outcrops flanking the mountains for 15 or 20 miles or more on both sides of the Balcibamba and the Llaucon Valleys, and even extending southwestward in the direction of the anticlinal to or across the Maranon River. So far, our investigation has discovered that this coal field would be composed of two parallel basins extending northwest and southeast, separated by the anticlinal of the Balcibamba Valley. The one basin dipping to the northeast for an unknown distance under the mountain, and perhaps having its northern margin somewhat near the junction of the Llaucon and Maranon Rivers. The other basin dipping to the southwest under the limestone measures forming the continental divide between Hualgayoc and the town of Chota. Future explorations may discover its southwestern outcrop 20 miles or more distant on the Pacific slope near the headwaters of the Rio Chancay. In some parts of this latter outcrop, however, fierce volcanic action has prevailed which would tend to seriously affect the economic value of the coal seams.

So far as we know at the present time, no economical coal beds have been uncovered as yet on the Pacific slope in this northern field. At the southernmost point, where our trail crossed the outcropping measures on the Pacific side, indications of coal were prospected, but as the region was much disturbed by the eruptive rocks, the prospect was found to be worthless.

As before stated, the coal-bearing quartzite at Los Banos are about 3,000 feet thick, whereas the coal beds mentioned are found near the bottom part of these measures, and the 2,000 feet of overlaying rock were not examined. There is, therefore, a possibility of the existence of other economical beds higher in the measures, which would be revealed by careful prospecting. The country is very sparsely inhabited by a few natives to whom the coal is of no use. They, therefore, attach no more value to it than to the other rocks of the mountains, and have accordingly made no attempt to uncover the coal. Exposures, therefore, are few.

As to the quality of the coal in this northern region, we refer to the Analysis No. 1 below. We may say that the sample from which this analysis was made consisted of a number of pieces from all the openings in Veins No. 2 and No. 3 at Los Banos. These were the only ones which furnished proper samples for analysis, and while we had no opportunity to make a proper sample from the total height of the bed, still, this analysis will probably furnish a fair criterion in which to judge the quality of this coal.

ANALYSIS NO. 1.

Water.....	1450
Volatile matter.....	5633
Fixed carbon.....	83620
Sulphur.....	554
Ash.....	8743
 Specific gravity.....	
	100 000
	162

We would call attention to the high specific gravity of this coal. The anthracite coal of the Wyoming and Lackawanna Valleys in Pennsylvania would average about 1.5 specific gravity, whereas, this coal, as determined by Mr. McCreathe, and also as determined by us, runs from 1.62 to 1.65 specific gravity, which is a very good feature, indeed. We regard the anthracite of this northern coal field, as

far as we have been able to judge, equal to the average anthracite of Pennsylvania, as will be shown by analysis No. 1 by Mr. McCreathe of Harrisburg.

(To be Continued.)

CORRESPONDENCE

MASSACHUSETTS.

(From Our Special Correspondent.)

BOSTON, May 20, 1899.

EDITOR JOURNAL: After several weeks of lassitude, culminating in a severe drop in prices, on the announcement of Ex Governor Flower's death, the stock market has again taken on an upward swing. During this period of falling prices in the New York and Boston markets, copper stocks have held stronger than any other securities, although the trading in these stocks has been light. The financing of the Amalgamated Company stocks seemed to bring speculation in other specialties almost to a stand-still, but now that the New York banks have announced their willingness to accept Amalgamated as collateral, the tone of the whole copper share market has been changed. We look for a very active and rising copper market this summer, and believe that other cities besides Boston will take a stronger interest in this metal than ever before. A good deal of trading is being done in copper shares in New York and to some extent also in Philadelphia. Boston has a new favorite in the shape of Missouri and Kansas Lead and Zinc mines, and a good deal of money has been invested in these securities,

The Bald Butte Mining Company of Montana, the stock of which is held quite largely in Boston, has just declared its regular monthly dividend of 3 per cent and an extra dividend of 3 per cent. This makes the third double dividend in five months, or 22 per cent on the entire capital stock in that period. The writer is well acquainted with the owners and managers of this wonderful little gold property, and recommends it as an example for other mining companies to follow. The management is extremely conservative, and is largely responsible for the wonderful success of the mining operations carried on. The capitalization is modest, consisting of only 250,000 shares, having a par value of \$1. During the last seven years, the surprising total of \$700,000 in dividends has been declared. Ore is constantly kept blocked out three years ahead of the capacity of the twenty stamp mill. Nothing succeeds like success.

ROBERT S. BICKFORD,
Stock Broker, 60 State street.

Workshops of C. L. Berger & Son.

BOSTON, May 4, 1899.

EDITOR JOURNAL:—It was recently my good fortune to inspect the workshops of C. L. Berger & Sons, successors to Buff & Berger, instrument-makers of Boston, having the senior member of the firm as a guide. The recent boom in mining properties has taxed their facilities, ample though they are, to the utmost.

One of the most interesting exhibits in the whole establishment is the juxtaposition of two such celebrated instruments as the Temple and the Wurdemann automatic circle-dividing engines, each of which, if it has an equal, has no superior in this country or in the world. Each instrument, built by a mas-

ter-workman of the craft, represents twenty years of continuous labor or \$20,000 in cash. On these engines have been graduated the circles of some of the most celebrated astronomical instruments of the great observatories.

Many of the tools and instruments in use were designed by Mr. C. L. Berger himself, notably that by which he obtains the focal length of an object glass and marks the cross-wire diaphragms so that the value of the cross-wires is constant in all their instruments, whether used for studio work or for astronomical observations.

The enlargement of their workshops, the increase of their working force, and the addition of valuable machinery, has been made to meet the increasing demand for their instruments.

April 29th of the present year they celebrated the completion of the instrument numbered 3,000 by a banquet attended by their whole force.

Mr. Berger's two sons, who have recently joined the firm, have received their technical education in the best schools and workshops in this country and in Europe, and bring youthful zeal, enthusiasm, and, as one might say, inherited skill to the business, which bids fair to maintain for the firm the position of leaders—*facile princeps*.

Yours truly,
JOHN N. MCCLINTOCK, C. E.

UTAH.

(From Our Special Correspondent.)

SALT LAKE CITY, Utah, May 19, 1899.

EDITOR JOURNAL:—Although displaying fair activity, the mining share market this week was not characterized by vigorous up movements, and as a general thing lacked buoyancy and snap. Operations in the various mining camps are progressing vigorously, however, and probably the amount of work being done surpasses all previous records. The dividend payers have made their usual distributions of earnings and these stocks hold their figures firmly. Already in May, the sum of \$12,500 in dividends has been paid. This amount should be largely increased within the next two months, when two or three more payers will re-enter the list. As was the case last week, good support developed on nearly all weakenings.

For no good reason, Ajax lost considerable strength and sold off to the \$1.50 mark. A strengthening followed, however, and the stock closes in better tone. The mines are reported to be looking very well, and the stock is proving very attractive to investors. The management of the Alice has decided to push its search for copper ore. Already some copper is showing in one of the mines. The stock did practically nothing. Bullion Beck paid its May dividend on the 15th. Holders of the stock made no concessions after the dividend went off and quotations remained firm.

Very little was done in Centennial-Eureka. Buyers and sellers both refused to make concessions, and quotations remained unchanged. The mines are looking very well. The tanks at the Chloride Point mill are being filled with ore, and by the first of the month operations should be in full swing. The stock was dull again, but at present figures it looks like a buy, for a turn, at least. On very limited business, Daly sold off somewhat. No change occurred at the properties. It is now expected that the general movement of ore from the Daly-West will commence about

June 1st, in which event a great shipping record may be looked for. The stock was only fairly active, at last week's figures. There seems to be nothing in the market presenting greater possibilities than Daly-West. Dalton & Lark was fairly active at slightly better figures. This stock should see higher quotations during the life of the option. The first clean up under the new management is just being made at the Daisy mill, but it will be two weeks yet before any accurate report of conditions as they now exist can be prepared. Expenses are being greatly reduced and it is to be hoped that the company will soon be placed upon a much improved footing. The old management left the company in debt \$4,000. The stock was held at about last week's figures. It is reported that insiders were among the purchasers. One director has 10,000 shares which cost him 62½ cents per share. Eagle & Blue Bell was again lower. The recently encountered seam of \$100 ore has not yet widened out, but development work is progressing steadily. On reports of another strike, Emerald sold up to 17 cents, but lost some of its new strength under heavy selling.

Miscellaneous Mining News.

ARIZONA.

Copper Chief Mines.

Some three years ago Arthur Hendey, an old Colorado mining and mining machinery man, purchased the Copper Chief group of mines near Jerome, Arizona, and commenced development work upon them when he was stopped by some parties who had adverse claims against the property. The group has been tied up ever since by litigation, and nothing has been done in the way of developing the claims. A decision in favor of Mr. Hendey has been rendered and the property will soon be in operation again.

The Copper Chief is situated about five miles from Jerome, where the great United Verde group of mines are located. Not much development work has been done upon them, but if indications count for anything, the property will return large profits to the happy owner who is a thorough mining man and has the backing of some of Colorado's best known capitalists.

Some of the finest specimens of copper ore ever brought in from the Dragoons was recently brought to the office of the Copper King Co. This ore carries a high grade of copper the azurite and malachite incrustations, with deep blue and green native carbonates of copper are shown. The ore comes from the company's mines at Barrett and is much sought after as cabinet specimens. The company apparently have plenty of it, as the extent of the recent strike has not yet been determined.—*Tombstone Prospector*.

Three shafts are sinking the Tennessee shaft three feet per day. They are now at the 300-foot level, and drift both ways on the ore at that level has commenced. Everything is ore and its size is not known. The new cage is being put in above the mill, and after it is in place the 120-ton concentrator will run night and day.—*Our Mineral Wealth*,

A preliminary mining deal of unusual interest and magnitude has just been initiated on a valuable and well known group of copper properties on Pinto creek, belonging to W. T. McNelly, Con Crowley, Al Sicher and

Dan R. Williamson. The properties embrace seven claims and are bonded to eastern parties for a fair price says the *Prescott Herald*.

Under the terms of the bond development work must commence within thirty days, and the first payment on the property is to be made within four months. There is good prospect that work will be pushed energetically and the deal closed as contemplated in the bond, in which event another magnificent producer will be thrown open to the world.

CALIFORNIA.

AMADOR COUNTY.

The Spagnoli mine at Clinton is running in earnest. The gallows frame is of 12x18 inch timbers and is forty feet high. The perpendicular two-compartment shaft is already down forty feet and eight sets of timbers are already in. The timber used is 14x14 inch, with eight inch corner blocks.

S. E. Thornton, who has had charge of the working of the old dumps on the Empire mine at Plymouth, has bonded a mine on the ranch of George Easton and is erecting a hoist and such other machinery as is necessary for the thorough prospecting of the property.

Report has it that some rich ore has been encountered in the north drift on the 100-foot level of the Allison mine.—*Ledger*.

CALAVERAS COUNTY.

A mining deal has been consummated in San Andreas during the week that has attracted more than usual attention. It involves the reorganization of the Fellowcraft mine, sometimes known as the Lively mine, near town. Persons who ought to know consider the Fellowcraft a rich property with an assured future. Considerable work has been done and a ten-stamp mill is completed.

On account of a singular accident to the hoisting engine at the Utica mine in the early part of May operations at the mill were suspended for a couple of weeks. The skip becoming jammed when being lowered, dropped upon the drum of the hoist, necessitating a new hoist, which will be put in place as soon as possible. The loss to the Utica Company will amount to a large sum, considering the cost of repairs and loss resulting from the inability to operate the mill.

EL DORADO COUNTY.

An Eastern firm has purchased the interest of Colonel E. A. Head in the Blue Gouge mine, and it is the intention of the new company to commence active operations on the property immediately. The first work to be done will be the driving of a new tunnel, considerably lower and farther to the north than the present developments. Should the ore pay shoot continue to this level, as they are confident it will, they purpose erecting a five-stamp mill for prospecting only, after which a mill commensurate with this immense body of ore will be erected. Edward Bird, who is to superintend operations, sent two men to extend tunnel No. 4 100 feet farther.

The Dench and Craddock two-stamp mill, just at the edge of town, was started up last week. They have nearly 100 tons of high-grade ore on the dump.

KERN COUNTY.

The purchase was completed May 23rd by which the Little Butte Co. of Randsburg, Cal., secured control of the Butte mine for \$50,000. They have also under bond the Jo-

hannesberg Water Co.'s plant. It is their intention to erect a 20 stamp mill immediately. The Butte mine has produced about \$100,000 in the past year, so that the purchase is considered a bargain.

Business is active on the Sunset oil wells. In the past two weeks another well has been sunk to a depth of 700 feet. This touches the oil stratum.

Indications are that a few feet farther and a bountiful flow will be reached. The flowing well struck some time ago continues its good work without showing the least sign of weakening. Good news comes in from other fields where operations are going on.

The Kern county oil fields are beginning to attract wide attention.

The Buckboard mine, owned by Donovan, Matheson and Adams, is showing up in great shape. The ledge reaches a width of fifteen feet at places and all horns. The deepest shaft is 135 feet and drifts are now on each side. The boys have considerable ore on the dump and are developing all the time. They talk a little of putting in a mill of their own if further development maintains the present favorable outlook.

Garlock.

Mr. Longsway is down 70 feet on his ledge at Upper Goler, with fair prospects and good ore.

Hall and Tittle are down almost 100 feet in their Sand Canyon ledge and will soon be feeding their cyanide plant on that kind of material.

P. Cudahy and several others are doing well dry washing at Mesa Springs.

Andy Bland has bought the Spangler Bros. mill at Garlock and moved it to Garden Station, to use for custom work.

O. Castro will move to Kane Springs this week, where he has a good placer mine.

The Lee copper mines have been bonded to S. Swayer and Mr. Harker for a nominal price.

LOS ANGELES COUNTY.

Mr. Geo. Rubich is putting up a cyanide plant on Arrastral creek on the Melrose ranch near Acton.

A San Francisco company is going to reopen the old copper mine at Acton. In 1863 some very rich copper ore was taken out of this mine, and there was nearly \$3,000 worth of fine machinery put in the bottom that is there yet, covered up with about 150 feet of water.

The following delegates were elected to represent the Cedar mining district at the Miners' Convention, which was held in the Chamber of Commerce in Los Angeles on the 29th of April: Hon. Henry T. Gage, Hon. S. M. White, Hon. George J. Denis, Dr. G. Gehring, N. M. Melrose, R. E. Nickel and Ed. Lyons.—*Arion Roaster*

MARIPOSA COUNTY.

Articles of incorporation of the Quail Mining and Milling Company have been filed with the Secretary of State. The Board of Directors consists of N. F. Pickle, Read McCraney, A. Colby, J. C. Bunner and C. H. Teaff. The property is located in Mariposa county, and was secured from J. M. and C. P. Whitney.

TUOLUMNE COUNTY.

At the Mack, Big Oak Flat the main two-compartment shaft has been driven down 280 feet, with sinking going on at the rate of 15 feet per week. All work is being confined

for the present to this shaft, which will be sunk to a depth of 500 feet before any further drifting is done, although stations are being put in as each 100 is passed. The vein so far has carried an average width of 12 feet, and the ore is reported as particularly good.

Returns from the shipment of rock, 16 tons, which was sent to Selby's last week from the Vine Spring mine, have been received, showing that the ore went a trifle over \$13 per ton.—*Union Democrat.*

COLORADO.

The Ahunde mine, near Georgetown, is rapidly coming to the front, and promises to again take its place among our greatest producers.

The strikes made some time ago in the 850 and 1000 levels have been followed by a still richer strike in the 750 level. Ore was encountered in this level the past week that reminds one of the bonanza days of the Colorado Central mine, so rich is it to the eye of the miner. Specimens of the ore at the company's office show it to be a solid streak six to eight inches in width, and composed of an intimate mixture of brown zinc blende, ruby silver, gray copper or polybasite, and galena. It contains enough of the rich silver minerals to make it mill several thousand ounces to the ton. As the ore has but just been encountered, its extent is not known.

Mr. Maxwell had a mill run from the Frostburg, near Georgetown, Colorado, a short time ago, of 24 tons of ore in two classes, which netted \$2,432.60.

A half-dozen assays were made of ore and rock from the Ona Bell lode, Argentine district, which returned from four to eight ozs. gold, and from 70 to 420 ozs. silver.

GEORGIA.

The Dahlonga Cons. Gold Mining Company, Dahlonga, Ga., have given the Edward P. Allis Co. an order for a 120-stamp mill, each stamp 850 pounds weight. The mill is provided with hydraulic classifiers and thirty-six Reliance True Vanners, so that the pulp, after passing over three sections of copper plates, is sized in the classifiers and concentrated on the vanners.

One large Gates Crusher crushes all the ore from 120 stamps, which is distributed to the various bins by belt conveyors.

The power for the mill is derived from two 6' Pelton Water Wheels, and the vanners are driven by Pelton Water Motors. The concentrates will be conveyed by an electric trolley road to the chlorination plant, the order for which was also given to the Allis Company.

This plant is equipped with a Holthoff-Wethey Roasting Furnace 10'x100', having a cooling floor attached for cooling the ore after roasting and before chlorination takes place. There are two five-ton chlorinating barrels and the necessary tanks, etc., in the chlorination plant, which will treat at least thirty tons of concentrates in twenty-four hours.

The Allis Co. were also given an order for a twelve drill capacity air compressor, with all the necessary drills, tools, etc., belonging thereto. This compressor will be located in the power room of the stamp mill.

The chlorination plant is also driven by a Pelton Water Wheel.

It is expected that the two plants will be in operation by September 1st of this year.

IDAHO.

The air compressor for temporary use at the Last Chance is now on the ground, having reached Wardner last week. It is a second hand one bought in Spokane, and will be used until the large new one, recently ordered, is ready to run.

The old air compressor which went through the Gold Hunter fire has been thoroughly overhauled and put in place. As soon as a few missing or injured parts arrive, it will be ready to run. The shaft is down about 35 feet, and some remarkably fine ore has been found in it.

A new double-decked Wilfley table is being put into the Morning mill, near Wallace, Idaho, the first one in this district, if not in the world.—*Wallace Press.*

MICHIGAN.

The Ropes gold mine has ceased working, and Michigan's last gold mine has gone out of business.

The transfer of the Lake Superior Iron Company of its mines and property in Ishpeming and vicinity to the Oliver Mining Company was made in Boston recently. By this transaction the Oliver secures possession of one of the finest properties producing iron ore in the Michigan fields.—*Iron Ore.*

MINNESOTA.

The Fall Lake Land Company, which controls the Copper Creek mines, which in the early days were developed by the American Fur Company, has procured a pump and other necessary tools needed for that work and will start at once to pump out the deepest shaft on the property.

It has been years since work was done there by the Astors, and the workmen that were then employed there do not have a distinct recollection of the shaft. The depth is supposed to be in the neighborhood of 130 feet, and it is known that about 260 feet of drifting was done, but at what depth is uncertain, although it was probably as far as 80 feet or more. The men that helped do the work say that they distinctly recollect cutting across masses of rock that was copper bearing, but as the owners were then looking for mass copper, no attention was paid to rock that would now be considered worth mining. In those days the company had figured on carrying the copper in wagons to the Nemadji river, ferrying it across, and then having it loaded on boats and taken East.

The Superior and Boston Company, owner of the Fond du Lac mine, now has men at work on that property doing actual development work. A great deal of blasting has been done, and some fine samples have been procured. From the indications it would seem that the vein is carried along the surface for a considerable distance, some of the best specimens Capt. Thomas has yet sent in having been procured west of the Stuart shaft. The camps are all erected for the accommodation of 25 or 30 men, and the company has sent to Michigan for a number of experienced miners to aid in the development work.

The Percival Copper Mining Company will put in steam drills at the Percival mine as soon as the machinery can be procured and placed. With this improvement, the sinking of the shaft will produce about twice as fast as at present. The shaft is now 60 feet deep, and drifting is going on.—*Duluth News-Tribune.*

About 75 to 80 cars of ore is now mined and shipped daily from three of the Consolidated mines near Hibbing, Minn. These mines are employing about 300 men and could furnish employment to nearly as many more.

An advance of 10 per cent was recently made in the pay of the surface men employed by the Consolidated Mining Company.

Four drill crews are at work on the Sheridan-d'Auremont property, at Hibbing, on which John Jones holds an option.

MISSOURI.

An output of 122 tons of Jack was made from the Prosperity mine, and 100 tons from the Tuttle & Company mine, both on the Minor & Rogers land near Auburn, Mo.

County Collector Emry was displaying some very rich ore which was taken fourteen feet below grass roots from forty acres of land owned by the Emry estate. The land adjoins the Cholwell land on the south and is just a quarter of a mile from the city limits.

The lead strike made by Warren Armstrong & Co., on the Shoal Creek Mining Company's lease on Silver Creek is proving extra rich. A. P. Clark, one of the owners of the lease, says that from a drift started recently on the sixty-foot level 5,000 pounds of lead was taken out in the afternoon. The mineral is found in great chunks, and some miners who have seen the Wonderful Eight mine at Saginaw, say this shows up bigger and richer than that wonderful producer.—*Joplin Sunday Herald.*

MONTANA.

A deal was closed this week whereby M. J. Garrity and Charles Bartholomew gave a bond to a Chicago syndicate on their properties near Homestake for \$10,000. The property is one on which the owners have done considerable work and from which some good ore has been shipped. In the generally increased inquiry for mining properties, the Homestake range is attracting a share of attention, as it certainly deserves to do. There are several active development propositions now being successfully worked in that range. The Chicago parties, represented by Mr. Highland, have taken hold with a vim. Mr. Tremain, the inventor of the Tremain mill, is said to be demonstrating the statement that his mill is especially adapted to the treatment of the ore of the Homestake district.

The Minnesota Standard Mining Company, operating at Marysville, has let a contract to Butte parties for a 300-foot extension of the tunnel in the Omaha lode. This tunnel is being run on a ledge, improving as depth is attained, and the company is confident the completion of this work will furnish a paying mine.

A rich strike is reported on the 50-foot level of the Bamboo Chief mine, one mile west of Virginia City. Assays of ore extracted from a vein varying in width from 15 to 20 inches shows returns of \$1,500 per ton. The lessees, John Devlin and Charles Grove, intend to utilize the Largey mill, located a short distance from the mine, for the purpose of working the ore.—*Helena Independent.*

NEVADA.

The Green plant is running on tailings from the Wide West mill at Aurora, Nevada, which are quite rich.

Mr. Champion, Vice President of the Vul-

can Mining Company, accompanied by three mining men, visited the mines near Soda, Nevada, recently. Reports from the mines are favorable. A carload of miners' implements for this company reached Soda last week. About 20 men are employed.

A. W. Curtis returned to Star last week. He says the mines there are all looking well. Ross Condon has a lease on the Fottler and is taking out lots of pay ore. The Hardscrablers, Bounce and Duke are regular producers.—*Walker Lake Bulletin.*

NEW MEXICO.

Output of Hillsboro gold mines for the week ending Thursday, May 18, 1899, as reported for the *Advocate*:

	TONS
Wicks.....	20
K. K.	15
Richmond.....	35
Snake Group.....	65
Opportunity.....	20
Sherman.....	5
Cincinnati.....	10
Trippe.....	55
Rex (silver-lead)	5
Eureka.....	10
Freiburg.....	10
American.....	15
Warren.....	20
Happy Jack.....	10
Black Diamond	10
Total.....	305
Total output since January 1, 1899—	5,620.

One of the richest strikes in Hillsboro district is that at present being developed at the Lookout mine, on Trojillo Creek, owned by Hon. J. M. Webster and Col. J. P. Parker, and the owners and several lessers thereon will certainly become very rich men. About four tons of the ore sampled here at Aloys Preissner's laboratory during the week yielded the astonishing values of 9,000 ozs. silver and 23 ozs gold per ton. The vein from which this ore is taken is said to be fully two feet wide, the ore being a gold and silver tellurium. As a consequence the wildest excitement prevails on the creek, and the whole region is being located by excited miners from the neighboring camps. A leaser named Riggins made the strike, on the surface, after prospectors had walked over it for years and left the mark of their shoe nails on the rich ledge. Robins & Hiltz of Hillsboro and Knight & Slease of Lake Valley, own the extensions of the bonanza vein, and were in ore at last accounts.

OREGON.

E. Ridener, a Pine creek rancher, owns the White Lily, Gold Standard, War Eagle and Oregon, about eight miles north of Ballard's Landing, all of which are splendid copper prospects, excepting the White Lily, a free milling gold proposition showing values as high as \$42.20 per ton.

In bar placer mining men are making as high as \$3 per day with crude rockers on Snake river.

It is reliably reported that Robt. Fullerton has struck a rich 16-foot ledge in the Virtue district, near Baker City, Ore.; that great excitement prevails and a big rush of prospectors is headed that way.—*Baker City Democrat.*

SOUTH DAKOTA.

Shipments of ore will commence soon from the Cherry Gulch lode, near Nevada Gulch, S. Dak., by the lessees, D. C. Boley, W. M. Barker and associates. A shaft has been put down about 150 feet, and about 250 feet of drifting, east and west, has been done. There has been ore in one of the drifts for some time, and the best of it has been mined and stored ready for shipment. It was at first believed that the best ore shoot in the mine was a continuation of the Ben Hur ore body, but a survey shows the latter shoot to be farther to the east. A very neat hoisting plant is being used at the shaft.

The water has been pumped out of the J. R. shaft, and it is the intention of Mr. Crocker to commence sinking.

The water is all out of the Golden Slipper shaft, and the boys have commenced work in the mine.

An eight-foot gold-bearing ledge has been uncovered in the drift from the 460-foot level in the Sunnyside mine.

R. M. Maloney has taken an option on the Crane group of claims in Friday gulch from Joe Sharp, Byers and Pettit.

Several carpenters are at work in the Bismarck mill, and it is expected that the plant will be ready to commence crushing ore next week.

Del and Bill Canfield, who are at work on the Black Jack claim in the Burnt Fork district, have struck free gold-bearing quartz in their shaft at a depth of 40 feet.—*Black Hills Mining Review.*

UTAH.

E. P. Jennings, late general superintendent of the Newhouse and Wier mining interests at Bingham, Utah, has been transferred to the Dragon iron mine property of the Copper Trust. The Dragon property is one of the greatest iron-gold copper mines of the world, all of the work on which through all the years has been practically confined to the surface is now being put in shape to be sunk 1,000 feet or more for the development of its copper possibilities. It is a fact not generally known that for many years the smelters of Salt Lake Valley stole the gold values contained in the iron which they purchased for flux from the owners of this property. It is proposed to extend the East Tintic railroad to the Dragon.

Messrs. Gustaldi & Co. are now working three shifts on the mine located in North Tintic. As development work progresses the ground grows richer and from all indications they will soon be classed with the great producers of the district.—*Saint County Republican.*

WASHINGTON.

The Republic Giant tunnel was driven about 45 feet last month, and a shaft started which at ten feet depth exposed a vein of solid quartz, fully five feet across. Work is being pushed on both tunnel and shaft.

In the North San Poil shaft the 100-foot level has been reached and drifts started both north and south in ore that will average above \$30. With the exception of a sump below the drift level, sinking will be discontinued for the present.

The Surprise is attracting the camp's attention. The average of a number of samples taken from open cut No. 3 was \$47.90.

Work has not yet commenced on the new Mountain Lion shaft, but a whim is being installed at the old shaft, which is to be sunk at once to the tunnel level.

The steam pump is in operation on the Bodie, and the shaft will be cleared of water in a day or two. The shaft is down 115 feet, and will be sunk at once to the 100-foot level, and the vein crosscut.

The Sunnyside is a claim situated on the east bank of the San Poil river and owned by the Sunnyside Gold Mining and Milling Co., a local organization. A six-foot ledge of good looking quartz crops on the claim, and ore from the ten-foot shaft assays \$7 in gold. A contract was recently let for a fifty-foot crosscut tunnel, and upon its results will depend the future exploitation of the company.—*Miner and Electrician.*

FOREIGN MINING NEWS

BRITISH COLUMBIA.

Herewith we present our readers with the figures of the output for April. It exceeds that of April, 1898, by 1,829,839 pounds. The shipments via Nakusp have fallen off to a considerable extent owing to bad roads and the extension of development work on Slocan lake properties, the prosecution of which naturally curtails the output of ore, says the *Kootenaiian*.

Below is a list of the mines which shipped over the Kaslo & Slocan Railway during the month, together with their respective amounts:

	POUNDS
Payne.....	2,705,000
Last Chance.....	960,000
Whitewater.....	525,000
Slocan Star.....	345,000
Jackson.....	218,000
Rambler.....	202,000
Dardanelles.....	40,000
Ivanhoe.....	38,000
Total.....	4,033,000

This was distributed among the different smelters and ore buyers as follows:

	POUNDS
Omaha.....	2,511,000
Kootenay Ore Co., Kaslo.....	732,000
Everett.....	565,000
Aurora.....	562,000
Great Falls.....	314,000
San Francisco.....	240,000

Total.....

The total clearances of the Kaslo port on ore for April were:

Gross lbs. ore.....	4,296,800
Pounds lead.....	2,074,384
Ounces silver.....	227,1800
Value.....	\$191,157

Of this amount the following is reported from the sub-port of Nakusp:

Gross lbs. ore.....	120,800
Pounds lead, contents.....	46,764
Ounces silver.....	6,080
Value.....	\$5,582

The duty paid the United States Government on this amounts to \$31,115.76.

Development work on the Union Jack, located four miles west of Cranbrook near the railroad, is making a magnificent showing. A shaft ten feet deep shows a conjunction of three leads, and the owners, Messrs. Love,

THE MINING AND METALLURGICAL JOURNAL

MONTANA'S MINERAL PRODUCTION

From Eugene B. Braden's report of the metals produced in Montana for the Calendar year of 1898, we take the following, copper and lead being figured from the average price of those metals during the year; copper \$12, lead \$3.78

COUNTIES	—Gold—		—Silver—		—Copper—		—Lead—		Total
	Line ounces	Value	Line ounces	Cubic feet	Fine pounds	Value	Fine pounds	Value	
Beaverhead	9,391,674	\$ 189,277.50	368,261,912	\$ 176,139.21	121,039	\$ 11,246.68	1,782,150	\$ 50,816.61	\$ 1,782,150
Broadwater	10,552,024	218,129.63	284,168.06	367,469.21			1,600,000	60,480.00	6,146,503
Custer	52,910	1,094.37		3.45					1,094.37
Garfield	1,008,563	20,818.85	130,397.96	556,474.13			3,729,168	140,962.55	718,272
Custer	62,206	1,285.91		10.33					1,285.91
Deer Lodge	23,504,896	485,889.33	10,732.13	13,875.88			1,000,000	37,800.00	5,376,000
Dergus	6,201,608	128,198.61		271.35					128,198.61
Flathead	1,522,716	31,177.33	75,29.80	97,279.86	116,604	13,992.48			13,992.48
Grant	8,541,411	176,008.50	1,003,416.91	1,297,317.11	55,000	6,600.00			6,600.00
Jefferson	10,913,572	226,223.71	1,036,889.28	1,310,624.52	17,954	2,154.48	1,349,715	50,679.03	1,349,715
Lewis and Clark	13,809,555	907,181.31	166,959.31	215,862.70					1,122,000
Madison	17,210,616	976,550.20	111,291.95	14,896.50	20,680	2,181.69	270,477	10,224.79	1,119,716
McGowen	153,804	3,179.11	169,012.19	206,884.45			8,000,000	226,800.00	1,560,800
Missoula	3,066,274	63,385.51	3,422.34	4,036.96			122,681	4,637.31	7,000,000
Park	641,618	13,268.42		103.55					13,268.42
Ravalli	60,836	1,257.59		4.81					1,257.59
Silver bow	55,343,589	11,144,059.52	8,996,555.01	11,631,909.51	216,648.07	25,997,760.24			25,997,760.24
Teton	35,463	733.09		2.53					733.09
Returns from custom smelters, mints and assay offices, impossible to classify by counties	31,471,425	650,572.09	2,171,216.99	2,807,231.07			5,758,211	217,660.37	367,469.50
Total.....	253,867,787	\$ 5,247,912.91	14,818,661.98	\$ 19,159,482.17	216,979,354	\$ 26,037,522.18	21,403,702	\$ 809,060.69	\$ 51,244,978.27

Hoggarth, Usher and Ryan, are feeling jubilant over the prospect. Assays at a depth of a few feet show \$25 in gold, 58 ounces silver, and values in copper ranging from 17 to 77 per cent.

The Minnehaha in Camp McKinney, B. C., is to be at once equipped with a ten-stamp mill, and is expected to be ready to operate some time in July.

Work continues on the main adit at the Velvet mine, which is to tap the ledge at a depth of 320 feet. This adit has now been driven for a distance of over 200 feet. It is expected that it will tap the ledge when it is in 400 feet. The crosscut which was recently commenced on the 250-foot level is making good progress. There is no work in progress on the 160-foot level.

LOWER CALIFORNIA.

More Placer Strikes.

Marvelous rich placers have been discovered at a place known as Santa Clara, on the peninsula of Lower California, about 370 miles from the boundary line between the United States and Mexico. Dry washers are used in the extraction of the gold, water being scarce, and about \$158,000 taken out in this way was sent to merchants at Guaymas, Sonora. As usual, when rich strikes in placer gold are found, many people rush to the point indicated, some of whom could not tell gold from mica, unless it was coined in money. This new field is reported to be twenty-eight miles long by fifteen wide.

MEXICO.

President Diaz in his message says:—

"The mining industry is that which affords most evidences of rapid progress, as in the periods covered by this report 1,040 title deeds, covering 11,408 "pertenencias" of one hectare, have been issued. The total number of title deeds issued, subject to the new legislation of June, 1892, is 9,353, covering 77,774 "pertenencias" of one hectare each."

The exportation of ore has also increased to a noteworthy degree. Taking the figures recently published by the department of fin-

ance, for the seven months, July to January of the present fiscal year, it appears that the value of exportation of mineral products, metallic and non-metallic, was \$54,371,000 in round figures, showing an increase of \$1,043,000 over the value of the same products exported in the corresponding period of the previous year.

As an important event in the mining industry, I will state that the Adventurer tunnel at Batopilas, which is nearly three kilometers in length, which has been fifteen years under construction, and has cost millions of dollars, has just struck the principal lodes of the camp.

The new machinery for the Prietas mine at Parral, which has shut down for some time, is being taken up the mountain and will shortly be put in place, and work will be started up on this valuable property.

Two new smelters are to be put up at Santa Barbara, Chihuahua.

The Tecolote mine at Santa Barbara, Chihuahua, has been lighted by electricity.

O. C. Wheeler has opened a three foot vein of ore with the new shaft on the Santa Rosalia, which runs 50 ounces in silver and a strong trace in gold. The Santa Rosalia is in the outskirts of Parral and was worked by the Spaniards, but has been idle since the slump in silver.—*Chihuahua Enterprise*.

GENERAL NEWS

Catalogue No. 14 of the Weber Gas and Gasoline Engine Co. of 434 S. W. Boulevard, Kansas City, Mo., has been received by this office. The pamphlet is published for the purpose of expounding the merits of the Weber Gas and Gasoline Engine and equipments which are so well known that mention here is unnecessary.

The Chicago Pneumatic Tool Co. has purchased the patents formerly owned by the Consolidated Pneumatic Tool Co., now defunct. These patents include all the Keller and Wolstencroft types of tool construction and in addition several new applications which have not yet been taken out. These patents originally cost the Consolidated Pneumatic Tool Co. about \$40,000.

British Columbia's Mineral Production.

Below we publish extracts from the annual Report of the Provincial Minister of Mines for the year ending December 31st, 1898.

The output of a mine for the year has been considered that amount of ore for which the smelter or mill returns have been received during the year. This system does not give the exact output of the mine, but rather the amounts credited to the mine on the company's books during the year.

For ore shipped in December, the smelter returns are not likely to be received until February, or later, of the new year, and have, consequently to be carried over to the credit of such new year.

In the lode mine tables, the amount of the shipments are obtained from certified returns received from the various mines. In calculating the values of the products, the average price for the year of the New York Metal Market has been used as a basis in all cases. For silver 95 per cent and for lead 90 per cent of such market price has been taken. Treatment and other charges have not been deducted.

The total production for all years up to and including 1898 is:

Gold, placer	\$ 59,960,819
Gold, lode	6,501,906
Silver	9,676,901
Lead	4,039,199
Copper	1,395,841
Coal and coke	40,306,160
Building stone, bricks, etc.	1,500,000
Other minerals	26,000

Total \$123,417,326

The production for each year, from 1890 to 1898 inclusive, was:

Year.	Amount.
1890	\$ 2,608,803
1891	3,521,102
1892	2,978,530
1893	3,589,413
1894	4,225,717
1895	5,643,042
1896	7,507,956
1897	10,455,268
1898	10,906,861

The table below gives a statement in detail of the amount and value of the mineral prod-

ucts for 1898. Gold and silver is estimated by the ounce, copper and lead by the pound, and coal and coke at 2,240 pounds to the ton.

	Quantity.	Value
Gold, placer.....	32,167	\$ 643,346
Gold, lode.....	110,061	2,201,217
Silver.....	4,202,401	2,375,841
Copper.....	7,271,678	894,781
Lead.....	31,613,539	1,077,581
Coal.....	35,000	175,000
Other materials.....		151,500
		\$10,906,861

The production of metals by the different districts and divisions for 1898 was:

Cariboo—		
Bakerville Division.....		\$94,500
Lightning Creek Division.....		37,000
Quesnellmouth Division.....		28,000
Keithly Creek Division.....		214,860
		\$389,360
Cassiar District.....		\$107,300
Kootenay East, District.....		133,368
Kootenay West—		
Ainsworth Division.....	\$	159,801
Nelson Division.....		694,880
Slocan Division.....		2,619,852
Trail Creek Division.....		2,470,811
Other parts		97,631
		\$6,042,975
Lillooet District.....		47,814
Yale—		
Osoyoos.....		364,112
Similkameen.....		7,560
Yale		60,840
		\$432,512
Other Districts.....		19,437
Total, All Districts.....		\$7,172,766

DRY GOLD PLACERS.

BY PROF. GEO. H. STONE

(Begin in our issue of May 1, 1899.)

At San Pedro the lower slopes of the mountains are covered with a talus or drift composed of the rocks exposed on the mountain sides. The fragments are of all sizes, from the finest dust up to boulders. All are somewhat smoothed and rounded at the angles, but no more so than would result from their being washed down the slopes. The spaces between the large fragments are filled with a fine earthy matter that contains some lime and iron oxides and hydrates. When dry it forms a compact cement; when wet it disintegrates somewhat readily. The gold is found at one or more levels, sometimes at or near true bedrock, at other times many feet above it. It occurs in pay streaks which are usually less than a foot or two in thickness. They are narrow and seldom more than a few feet or rods in length. The drift from the mountains is of various depths up to 70 feet or more. Mining is conducted by sinking shafts about 30 feet apart (30 feet is a Mexican claim) and hoisting the dirt in a bucket. As needed, some of the dirt is dried by a fire and sampled by "dry panning." When a pay streak is found it is followed by tunnels and mined out like coal. Only the pay streak is hoisted after the shaft and tunnels are opened. The pay dirt is spread on the ground, dried, and then treated with a "dry washer." The dirt is at first screened to remove the coarser gravel. The finer dirt is then made to slide in a thin sheet over a fine inclined screen. As it passes over the screen a current of air is forced up through it by a blower. The rising air causes a boiling motion in the sliding dirt,

the gold settles on the screen where it is caught by ruffles, the dust is blown away, and the coarser matter slides on as tailings. In the tailings we find many pieces composed of sand grains cemented by the earthy matter. These contain gold. The tailings will yield gold repeatedly after lying a while in the sun and rain. The earthy cement must be thoroughly disintegrated before we can get all the gold. The firmness of this cement is further shown by the fact that the shafts and tunnels are never timbered yet will remain for years before they collapse. It is hard and slow work to loosen the cement gravel with a pick and the force required to excavate it while dry is very great. Those who plan to excavate it bodily by steam shovel have proposed to first loosen the mass by blasting. There is loose gravel in the beds of the streams but it was worked out years ago. At San Pedro the Mexicans will at any time work for others at \$1.50 a day rather than dry placer for themselves. It is a risky business. It may take a month to find a pay streak and that is soon exhausted. The populations that depend on dry placers are poor.

At the Jicarillas the conditions do not differ greatly from those at San Pedro. There is a larger rainfall and more placering is done by the use of water in pans, rockers, etc. The loose gravel in the gulch channels was worked out long ago. Good gravel is found far up some of the small valleys near the outcrop of veins. The lower portions of the larger gulches towards the plains are covered with broad sheets of gravel 70 or more feet thick, containing several pay streaks at various levels. An interesting class of auriferous gravel is found alongside or near the outcrop of eruptive dikes. The dikes are capped by low ridges or flat deposits composed of fragments of the same rock as the dike, all somewhat smoothed and worn at the angles. The gold occurs as nuggets (a little rounded at the angles) on the flanks of the dikes, accompanied by many fragments of iron oxides, some of large size. This is the coarsest and heaviest gold found in the camp. Both the pay channel and the fragmental capping or breccia that covers the adjacent dikes are saturated, so to speak, with a very adhesive red earthy matter which does not disintegrate when wet except after agitation. These cement areas do not follow the guiches but they do the dikes.

The above stated facts show that in order to work the dry placers without the use of water and hydraulic giants, there is required the following:

1. To find the pay streak if it is proposed to work only the richer portions. This will require the sinking of shafts and driving of tunnels. If it is proposed to work the whole mass of gravel we will have to handle much gravel that runs little or nothing.

2. To cheaply excavate the gravel. A man who can shovel say ten cubic yards of loose gravel in a day can dig and hoist to the surface by windless a ton or less. No way is known of excavating the pay streaks in the tunnels by machinery, though the hoisting might be done by power. The cost of excavating the gravel dry will always be one of the largest items of the cost of working. The cement is very firm unless wet. When dry its resistance to pressure (as of a dredge or steam shovel) would be very great.

3. To transport the excavated gravel and properly feed it to the separating apparatus.

4. To disintegrate the gravel. Only when the gravel is separated grain from grain is the enclosed gold released, especially in case of

the layers containing the most cement. Much of the gold gathered adheres to the larger stones unless the cement is thoroughly pulverized. We do not need to crush the grains of sand and gravel, for these seldom contain gold. What is wanted is to separate the fragments one from the other. Disintegration is a part of the process neglected by most inventors. Most inventors have mixed incoherent sand from the nearest stream with gold filings and when they have invented a machine that would recover this gold dry, they fondly imagined they could work the dry placers of the arid region. In fact, the dry placers have always been a favorite field for the exploits of the mining Ananias. The outside world hears of the gold, but little or nothing of the earthy cement.

5. To separate the gold and iron oxides from the quartz and other lighter matter.

6. To separate the gold from the iron oxides. Sometimes these oxides contain gold and ought to be saved.

It is not the writer's purpose in the present paper to discuss the means of separating the gold from the gravel by dry processes, but to point out the difficulties to be overcome.

Official Delegates Invited.

Through the State Department at Washington, one hundred and fifteen different countries, great and small, have been invited to send one delegate each to the International Commercial Congress to be held in Philadelphia in October, in connection with the National Exposition of American Manufactures for the Expansion of Export Trade. The invitations have been sent out by the Philadelphia Commercial Museum, under the auspices of which, jointly with the Franklin Institute, the Exposition will be given.

There are included in the list forty-eight mother countries, eight self-governing colonies, like Canada and the colonies of Australia; fifty-five other colonies, dependencies and protectorates; and the four new possessions of the United States. In the latter instances the invitations were sent to the Military Governors.

The Lee-Penberthy Injector Mfg. Co., of Detroit, Mich., send us the following, which is self-explanatory:

IMPORTANT AND FINAL DECISION

In the suit by the Penberthy Injector Company to restrain us from using the name "Penberthy" in our incorporate name, and on our "Lee" injector describing Mr. Penberthy's patent, the Supreme Court of Michigan has decided for the complainant and ordered us to discontinue the use of the name "Penberthy," which order we will fully comply with, not using it in our corporate name, nor on our "Lee" injector.

In future our incorporate name will be "Lee Injector Mfg. Co."

This decision and change of name will not change the policy of our future business, nor interfere with the manufacture and sale of our "Lee" injector and other goods manufactured by us; neither will said decision interfere with or have any reference financially to any party or parties who have purchased our "Lee" injector or transacted business with the "Lee-Penberthy Mfg. Co." in the past, or who may purchase "Lee" injectors or other goods manufactured by the "Lee Injector Mfg. Co." in the future.

The decree of the Courts has no bearing on the use of the name "Penberthy" by us in the past, but rule that we must not use it in any form in the future.

We shall push our business and the sale of

our "Lee" injector in the future as we have in the past, and trust we will have and maintain the hearty co-operation of all.

Yours truly,
LEE INJECTOR MFG. CO.
William O. Lee, Sec'y and Manager, Successors to Lee-Penberthy Mfg. Co. Thos. J. Sweeney, V. P., Mechanical Expert, inventor and perfector of the Penberthy Injector.

Detroit, Mich., May 12, 1899

Tuolumne county called a convention of miners on the 20th of May. The purpose of the convention was to organize a Tuolumne branch of the California Miners' Association. A delegation from the State Association was present, among whom were President Jacob H. Neff, Tirey L. Ford, W. C. Ralston, Chas. G. Yale, J. F. Davis, John M. Wright, and Edward H. Benjamin.

The good that the California Miners' Association has done for the industry in the past, cannot be overestimated, and the benefit to be derived from a branch of that organization in this county is plainly evident, says the *Sonora Independent*. The chief industry of Tuolumne is mining, and it is conceded to be the richest mineral section in the State, and by an association of this character much can be accomplished by united effort that would otherwise be impossible.

Silver-Plated Amalgamating Plates.
The plates made by E. G. Denniston of Denniston's San Francisco Plating works, 653 and 655 Mission street, San Francisco, Calif., are world-renowned, and have received 26 silver medals. Only the best Lake Superior copper and refined silver are used in their manufacture. They are made in any size, plain or corrugated. Mr. Denniston is the pioneer in the business, having been established for 35 years, and has made a great success, which is due to his thorough knowledge of the business, and the possession of the best facilities, also by depositing full weight of silver on every order.

The greatly increasing demand for these plates by gold miners has demonstrated their superiority over all other methods for saving gold, in quartz or placer mining, particularly fine or float gold. These plates are in great demand in all the Pacific coast mining regions from Alaska to South America, the Rocky Mountain mining States and Australia.

The work done at Denniston's San Francisco Plating works consists of gold, silver, platina, nickel, brass, copper and bronze plating on every description of metal work. The work done is first class, and done at lowest possible prices.

THE REDUCTION OF ORES.

BY C. E. ROGARDUS, OF SEATTLE.
(Begun in our issue of May 1st.)

In making up his mix, the metallurgist adds a certain per cent of galena for a carrier to save the gold and silver. About 12 per cent is used now.

Most of the iron occurs in the ores and sulphurates. The sulphur in a lead smelter is out of place and must be eliminated by roasting. In roasting, what it takes nature years to do man accomplishes in a few hours. When she finishes, there is left the red streak of iron stain on the mountain side, by which the prospector spots his ledge.

All parts of the charge, ore, flux and fuel, which is usually coke, are weighed and fed in regularly at the top of the furnace, a force draft being used to keep up the combustion. The process is continuous, the slag being drawn off from one point at regular intervals,

while the lead is taken out at a lower point when necessary. From January to January, it stops not, except for an accident, which, if it stops the furnace, is quite expensive. The lead bullion is now ready for the refinery, where the gold, silver and lead are separated.

When there is copper in an ore that goes to a lead smelter, sufficient sulphur is left in the charge to form a copper sulphide or matte and the copper saved in the same form as in copper smelting. As all lead smelters buy ores carrying more or less copper, they save it in this way, putting them in with the regular ores, but ores without copper are preferred. This matte is drawn out with the slag, from which it separates on standing, for being heavier, it settles to the bottom, and when cold it is broken off and saved.

In smelting there is a small loss in the slag, from volatilization and in the dust. The last is mostly regained when good dust chambers are used, but the first and second, especially the first, it is the object of the superintendent to make as low as possible. They vary with the fluxing and the manipulation of the furnace.

One method of refining the lead bullion will be given. The bullion is melted in a large iron kettle with a certain percentage of zinc, the zinc having a greater affinity for the gold and silver than the lead. They liquate on cooling. The zinc with the gold and silver is taken off, and the lead again treated. When the lead has given up all the precious metal, it will contain some zinc, from which it is freed in a cupel furnace by distillation and oxidation. The precious metals are placed in a sulphuric acid bath and heated, the silver passes into solution as silver sulphate, while the gold remains undissolved.

The silver solution is decanted, the gold washed, dried, melted and cast into bars. Pure copper sheets are suspended in the silver sulphate and by metathesis we obtain metallic silver and copper sulphate. When all of the silver is deposited it is washed, dried and melted and run into bars. The sulphate of copper solution is evaporated and crystallized. This is a large source of the blue vitriol of commerce.

The other forms of smelting are copper smelting and pyritic, alike in their products, both being mattes, a sulphide product having the precious metals dissolved in them. In consequence they need more of a subsequent treatment to yield a finished product. They verge into each other, varying from a matte high in copper with but little iron, to one mostly iron and a small amount of copper. A strictly iron matte can be made and is made at Deadwood, North Dakota, but as a rule a small amount of copper is desirable.

Pyritic smelting is designed to concentrate the value of pyritic or sulphide ores by heat, using the sulphur as a part, if not all, of the fuel, fluxing away the gangue and the metals of no value. Part of the iron forms a sulphide, making with the copper sulphide the matte carrying the gold and silver with them. The process is in successful operation at a number of places, but it is not an easy plant to conduct. In fluxing, the range is greater than in lead smelting and theoretically it is quite simple, but practically it takes an experienced man to obtain good results. No preliminary roasting is needed, as the sulphur is used for the fuel.

The matte produced will yield its value by three different treatments. A straight iron matte can be roasted and pan amalgamated the same as gold sulphurates are often treated. When there is sufficient copper to pay to save

it is shipped to a lead smelter, roasted and treated the same as a sulphuret ore, the iron acting as a flux. The copper forms a copper matte, while the gold and silver are taken up by the lead. The arsenic and antimony are made use of in pyritic smelting, whereas in lead and copper smelting they are obnoxious. They pass into the iron matte, forming arsenides, antimonides, sulpharsenides and sulpho-antimonides with the iron taking place of so much sulphur which may be used for fuel.

(To be Continued.)

Latest Mining Decisions.

Prepared by Andrews & Murdoch, Berrien Springs, Mich.

Where the owner of lands leased for mining purposes is in possession, no surrender or forfeiture of the lease is required. *Island Coal Co. vs. Combs et al.*, 53 N. E. Rep. (Ind.) 452.

Forfeiture of a mining lease for failure to develop the property within the time specified is not waived by the owner's mere silent acquiescence. *Island Coal Co. vs. Combs et al.*, 53 N. E. Rep. (Ind.) 452.

A lease of coal lands, reserving a royalty on the output as rent, and requiring the lessee, under a penalty of forfeiture, within a specified time to commence the work of developing the coal interest in the lands, by opening the shafts through which the coal can be mined and removed, and by opening mines so that coal can be mined and transported to the market, requires actual mining operations to be commenced within the time specified; and the mere erection and equipment of shafts and mines by which coal might be mined was insufficient. *Island Coal Co. vs. Combs et al.*, 53 N. E. Rep. (Ind.) 452.

PERSONAL NEWS ITEMS

JOHN MEDINA, superintendent of the Big Blue mine near Kernville, Kern county, Calif., is spending a few days in San Francisco, Cal.

BESSIE L. SHIRLEY of Salt Lake City, Utah, has commenced the publication in that city of the *Salt Lake City Mine and Stock Journal*. The paper is handsomely printed, the cover being printed with copper bronze ink on a cream-colored cover paper. There are twenty pages of well-selected matter besides being lavishly illustrated.

Messrs. C. E. LOOSE and WM. HATFIELD, two Grand Central mining men, of Utah, are visiting California.

C. T. MIXER, of Ishpeming, Mich., is examining some property near Telluride, Col.; from there he expects to return to Joplin, Mo.

JAS. E. RODRICK of Hazelton, Pa., is to succeed ROBERT BROWNLEY as chief of the Pennsylvania Bureau of Mines.

H. J. STUPP left El Paso, Texas, last week for Sonora, Mexico, where he is interested in the North Star mines.

ARTHUR MURPHY, manager of the Copper Ranch mine, in Rocky district, Beaver county, Utah, recently left Salt Lake City for the property. A new shaft will be sunk and it is expected that a smelter will be erected before freezing weather sets in next winter.

THOS. M. BUZZO, manager of the Alice mine, Walkerville, Mont., spent a few days recently in Salt Lake, Utah.

A. W. GIFFORD, a mining man from Jarillas, Tex., is spending a few days in El Paso, Texas.

GEO. O. BRADLEY of Salt Lake City, has recently returned from Bisbee, Arizona, where he has been inspecting the smelter and reduction works formerly designed by him.

R. W. BARRELL, who was recently in the employ of the Union Hill Co., near Deadwood, S. Dak., has left for Eastern Oregon, to examine a mining property in the interest of St. Louis capitalists.

ACIDS

Consumption is satisfactory and deliveries on contract are moving more easily. Spot supplies of blue vitriol are scarce, and makers are firm.

TRIMESTER

Trade is dull and prices low, owing to large stocks in the primary market. At this time there were 2,900 tons. Best unmixed seconds are quoted on spot at \$200 per ton, future at \$20.50, and thirds at \$18.50 per long ton, and fourths at \$18.00 per short ton.

NITRATE OF SODA.

Holders are opening more freely. Spot is quoted at \$1.600 per 100 lbs., per 100 lbs. and futures at \$1.550 per 100 lbs.

FINANCIAL NOTES.

Average Prices of Metals in New York per 100 lbs. from January 1st, 1899

Month	Copper	Tin	Lead	Spelter
January	14.75	22.48	4.18	5.34
February	18.50	24.20	4.49	6.28
March	17.54	23.82	4.37	6.31
April	18.61	24.48	4.31	6.67
May				
June				
July				
August				
September				
October				
November				
December				
Average				

Average Monthly Prices of Silver,

In New York per ounce Troy, from January 1st, 1899, and for the years 1898 and 1897:

Month	1899	1898	1897
	Cents	Cents	Cents
January	59.36	56.77	64.79
February	59.42	56.67	64.69
March	60.61	59.90	65.09
April	60.19	58.62	61.85
May	—	59.98	60.12
June	—	60.06	60.10
July	—	59.66	59.61
August	—	59.51	59.19
September	—	60.69	58.21
October	—	60.12	57.51
November	—	60.60	57.91
December	—	59.42	58.01
Year	58.26	59.79	

The Cleveland Mining and Stock Exchange Co.

New England Building, Cleveland, Ohio.

A Reliable Information Bureau for Miners and Investors to obtain FACTS Regarding Capital and Mines. Stocks and Mines listed. Send for prospectus.

Morgan-Watson Mining and Construction Co.

809-810 New England Building, Cleveland, Ohio

MINES AND STOCKS { We Buy, Sell, Lease and Bond Mines of all kinds
We Buy, Sell, and Negotiate sales of mining and other stocks.
We Furnish Machinery to work good mines under special arrangement.
We Furnish Capital to develop mines.



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ALL THE MINING CAMPS OF UTAH AND COLORADO ARE LOCATED ON OR REACHED BY

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THE SHORTEST, QUICKEST AND MOST DIRECT ROUTE TO

MERCUR AND CRIPPLE CREEK

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GENERAL PASSENGER AGENT,

Salt Lake City, Utah

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Necktie Pin Outfit

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Uniques, neatest & most durable ever placed on the market. Liberal comissions to jobbers. William Roche, inventor and sole manufacturer, 259 Greenwich St., New York U. S. A.

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ENGINEERING INSTRUMENTS

Barometers, Thermometers, Field Glasses, Microscopes and Accessories. Repairing Promptly Done.

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WANTS

Advertisements of this class containing not more than five lines will be inserted for not exceeding three months in any year, free of charge, to all paid-up annual subscribers.

Other than above \$1.00 per month
Advertisements not accepted for less than one month.

COPPER MINE. State full particulars in regard to development work location, distance from water, price of fuel, character of ore and returns from shipments. Must have at least 1500 feet of development work. Send all information possible. Address,

JAMES HOWARD,
Care JOURNAL Office,
150 Nassau St., New York, N. Y.

GOLD mine anywhere in United States, must have at least 1000 feet of development; where coal is not over \$6.00 per ton or wood \$4.00 per cord delivered; plenty of water; no objection to low grade ore if profit can be made by having large plant to amalgamate and concentrate; want 6 months working bond; no property considered unless owners are prepared to deposit certified check to be forfeited for expenses of engineer if property is not as represented. Address with price and full particulars,

J. E. M., Journal Office,
150 Nassau Street, New York, N. Y.

Watch this space for
Want Ad next issue

METALLURGIST and Chemist, ten years experience, is selling, are buying and smelting company in Mexico, desires engagement in the States or British Columbia. Address: "W. H. C." JOURNAL Office.

EXPERIENCED man desires position, can install, run and keep in repair stamping mills up to 1000 h. p. Knowledge of assaying and office work. Address: W. H. K., McCAMPBELL, C.

FOR SALE!

TWO-THIRDS interest in well developed gold mine in Sonora County, N. M. See Ad. page 21.

A GROUP of 4 copper claims in Northern Arizona. By-product of gold and silver recently discovered and show great promise. Will sell at a great bargain. P. R. HORNSTEIN, DURANGO, CO.

TRIMAIN Two Stamp Stenn Mill at Tucson, Arizona, 15-H. P. Boiler Pump and every thing complete, set up ready for work. In excellent condition, used less than six months. Address DREDGING MINING MACHINE CO., KANSAS CITY, MO.

ANTIMONY BISMUTH

PROSPECTORS having locations of this nature and wishing to sell at once for cash, will do well to address with full particulars, P. O. Box 2078 SAN FRANCISCO, CAL.

A VERY valuable, extensive Lead Mining Property in Southwest Virginia. Shallow sink over 200 feet and actual work has demonstrated richness of veins and purity of ore. Address: GEORGE FRANKE, Baltimore, Md.

FOR SALE AT A BARGAIN.

A 60-TON copper smelting Plant, consisting of two 30-ton furnaces, one of which has new seamless liner. Plant is complete in every detail. Also an 80-ton Silver-Lead Furnace, entirely new, never having been set up. All of the above located immediately adjacent to railroad. Enquire of GARDNER, WORTHER & GOSS, dealers in Mining and Mill Supplies, Tucson, A. T.

ORE TESTING

Complete mill for testing ores on practical scale by all processes to determine the best process adapted to treating any ore submitted. Processes in use investigated to overcome unnecessary losses, etc.

RICKETTS & BANKS,

Metallurgists & Chemists

NEW YORK CITY

See

Mining Stock Quotations

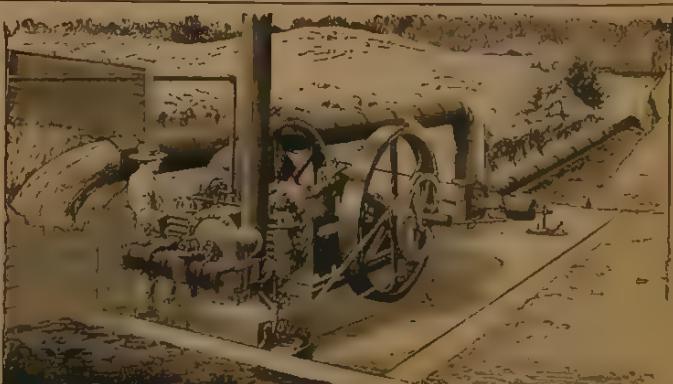
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John Wigmore & Sons Co.

MACHINERY
Mine and Mill Supplies, Iron and Steel

117 to 123 S. Los Angeles Street,

LOS ANGELES, CAL.



LARGEST GASOLINE PUMPING PLANT IN THE WORLD

The illustration shows the gigantic pumping plant recently built by the Hercules Gas Engine Works at the Packer Ranch, Colusa Co., 80 h. p. Hercules Engine, pumping 7200 gallons a minute, 2 feet 700 h. p. Burna Gasoline or Distillate oil. Cheapest power known. Gas Gasoline and Oil Engines. 2 to 200 h. p. Send for Catalogue. HERCULES GAS ENGINE WORKS, 210 Bay St., San Francisco.

MINING STOCK QUOTATIONS

BOSTON			
Adventure	12 00	Mass.	14 55
Alliances	11 62	Merced	9 60
Antarctica	65 00	Mt. Rose	31 00
Arcadian	69 00	Napa Quicksilver	9 00
Arnold	14 50	Old Colony Min.	17 00
Atlantic	34 50	Old Dominion	5 60
Battle	33 60	Oreocela	9 00
Bingham	18 00	Parratt	84 75
Boston & Mont'g	87 12	Pioneer	2 60
Breece	2 00	Rhode Island	165 00
Butte & Boston	52 50	Santa Fe	14 75
Calumet & Hecla	30 00	Santa Isabel	14 00
Catalpa	35 00	Tamarack	230 00
Centennial	41 00	Tecumseh	8 50
Cochiti	14 12 1/2	Tel. Mountain	12 25
Copper Range	45 00	Victor	5 60
Crescent	40 00	United States	24 87 1/2
Dominion Pref	116 60	Utah Mining	44 25
Franklin	22 00	Washington Mint	4 00
Gold Dredging	34 60	Winona	16 00
Hanholdt	2 50	Wolverine	10 00
Ice Toyosy	57 00	Wyanette	9 00
Velenos	4 00		

ROSSLAND, BRITISH COLUMBIA.			
Brit. Am't & G'd Co's	30	Kootenay Gold F.	
Brit.-Amer. Cor.	8 00	Lerwick	
Brit.-Col. Cos.	6 00	Lily May	18
Canad. G'd Fields	10	Loy & Van M. D. Co.	
Carrizo	1 15	London H. C. G. F. 7	60
Commander		Monte Cristo	12
Deer Park		New G'd & Ida B. C. 6	25
Dundee	35	Novelty	
Kvenning Star	88	Queen Ross Prop. 3	50
Fern		Rambler Con.	35
Gold Fields of D.C.C.	25	Red Mount, View.	
Hatton Brown		Reco	
Hill Mines	3 75	Silver Bell	
Homestake		Alliance	1 52 1/4
Iron Horse	18	Silver Queen	
Iron Mask		Anchor	10
Jesse		Buckeye	1/2 Malvern
Jumbo	12	Hullion Beck.	5 85 Mammoth
Kenneth		Cent. Bureks.	50 00 Mercur.
Keweenaw		Chloride Point.	81 1/2 Morgan
		Daisy	27 1/2 Northern Light
		Dalton	9 1/2 Omaha
		Dalton & Lark.	10 1/2 Ontario
		Daly	1 50 Rich. Anacoda.
		Daly West.	9 95 Sacramento
		Dexter	2 40 Shower Con.
		Eagle	29 1/2 Silver King
		Four Acres	40 00 Star Consolidated
		Galeena	29 Sunshine
		Geyer-Marias.	16 Swansea
		Golden Eagle	6 1/2 No Swansea
		Grand Central	7 82 Petro.
		Homestake	14 2/4 Utah
		Horn Silver.	1 25 Valeo
		Ingot.	28 West Mtn. P'I'ce
		Joe Bowers	15 Young Amerit.

SAN FRANCISCO.			
Alta Con.	8	Mexican.	48
Andes		Occidental	35
Belcher	34	Ophir	1 15
Boat & Belcher	53	Overman	13
Ballion	07	Ontario	
Caledonia	32	Plymouth	
Challenge	32	Potosi	25
Chollar	30	Quicksilver	
Confidence	76	Quicksilver pref'd	
Con. Cal. & Va.	26	Savage	23
Crown Point	18	Sieg. Belcher.	02
Deadwood		Sierra Nevada	93

COLORADO SPRINGS STOCKS			
Gould & Curry	35	Silver Hill	
Hale & Norcross	28	Standard	2 80
Homestake		Union Con.	43
Iron Silver		Utah	15
Justice	22	Yellow Jacket	37

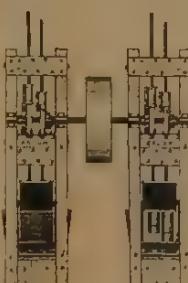
NEW YORK.			
Adams Con.	18	Isabella	80
Alamo	07	Iron Silver	05
Alliance	1 20	Jefferson	05 1/2
Anaconda	65	Jennie Blanche	02 1/2
Antonito	64	Justine	11
Argentum Junata	30	King & Penn	20
Belcher	30	Leadville Co.	10
Bent & Belcher	60	Little Chief	17
Breeze	2 05	Mexican	46
Brownsville	24	Mt. Rosa	28 1/2
Butt Gold	25	Occidental	28
Carroll	25	Ophir	1 20
Chapman	12	Pharacast	1 1/2
Comstock Tunnel	50	Pineapple	11
Comstock Stock	68	Plymouth	10
Comstock Script	88	Portland	1 67 1/2
Con. Cal. & Va.	1 61	Potosi	2 25
Cr. & Cr. Creek	10	Quicksilver	2 25
Crescent	16	Quicksilver pd.	8 00
Crown Point	35	Rio & Mt. Moutain	01 1/2
Cripple Creek Con.	10	Sin Jun Star	03 1/2
Deadwood	80	Sixty	22
Rikton Con.	91	Stella Nevada	94
Enterprise	20	Small Hope	1 25
Garfield Con.	13	Sonic	2 50
Good Sam'lian	15	Standard	2 50
Gold & G'd Co's	25	Spokane	1 25
Gold Cal. Gilpin	35	Spokane	40
Golden Fleece	33	Union	21 1/2
Gold & Globe	33 1/2	Utah Con.	15
Gold King	94 1/2	Utah Con.	12
Gould	26 1/2	Union Gold	—
Granite Hill	—	Vindicator	22 1/2
		Work	20
		Horn Silver	1 78

MEXICO.			
Bob Lee	81 1/2 Old Gold	81 1/2 Peoples	68 1/2
Elikton	24 Pilgrim	27 Pine Creek	—
El Paso	27 Portland	Princ Albert	1 59
Enterprise	27 Republic	Princ Albert	04
Fanny B.	25 Rosario	Repulic	05
Garfield Grange	27 Sacramento	Sacramento	04
Isabella	25 Tommack	Specimen	08 1/2
Jefferson	24 Tommack	Specimen	07
Jessie	27 Virginia M.	Specimen	—
Jordan Piece	27 Virginia M.	Specimen	—
Jack Pot	27 Virginia M.	Specimen	21 1/2

SPOKANE, WASHINGTON.

DENVER STOCK REPORT.			
Ben Hur	28 Number Six	12	
Black Tail	17 Palo Alto	14 1/2	
Bryan and Sewall	05 Pearl	12	
Butte and Boston	17 1/2 Potosi	04	
Cardman	03 Frances Muude	16	
Eureka First Th'	05 Quillip	18	
Eureka Queen	02 Republic	19	
Golden Harvest	07 1/2 Republic	3 25	
Gold Lent.	05 Republic Big Sis	1 25	
Iron Monitor	09 1/2 Republic No. 2	0 04 1/2	
Iron Mine	04 Star	10	
Liberty	04 Surprise	12	
Lone Pine Cons.	42 1/2 Tom Lamb	22	
Merrimac	08 1/2 Trade Dollar	22	
Moorac	08 Treasury	22	
Mountain Lion	37 1/2 Tom Lamb	22	
Acina	Keystone	11	
Anchoria Leland	Lathie		
Anaconda	51 Mata	31 1/2	
Arcadia	44 Mollie Gibson	27 1/2	
Argentum Junata	44 Moon Anchor	1 05	
Banner	— Mt. Rosa	24 1/2	

NOTE.—The above Mexican stocks are figured on the basis of Mexican silver.



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Krogh 2-Stamp Tripple-Discharge Quartz Mill, of Latest Improved pattern; Rock Breakers, Ore Feeders, Concentrators, Engines, & Boil. Hoisting Rigs to be operated by Horse, Steam Power or other motor; Ore Cars and Ore Buckets, Cornish and Jack-head Pumps, Triple-Acting Pumps, Centrifugal Sand and Gravel Pumps, Wooden Tanks and Pumps for the Cyanide Process, Pipe and Gate Valves, Link Chain Elevators for elevating and conveying all kinds of material. Estimates as to cost of machinery and its erection furnished upon application. Write for Catalogue and Prices.

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At Wholesale Prices Mining Timbers a Specialty Write for Prices

51 Beale St. and 9 to 17 Stevenson St., San Francisco, Cal.

LUMBER

FROM CRIPPLE CREEK

AIR COMPRESSORS,
ROCK DRILLS,
Stone Channelers,
The Pohle Air Lift Pump,
Coal Cutters,

THE INGERSOLL-SERGEANT DRILL COMPANY, HAVEMEYER BUILD'G NEW YORK
PARKE & LACY CO., AGENTS, SAN FRANCISCO, CAL.

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FRANK D. REED, Sec'y & Treas.

THE PORTLAND GOLD MINING CO.,
(Stock Transfer Office, Colorado Springs)
Mines at Victor, Co. idaho

COLOMBO SPRINGS, COLO., May 19, 1891

The Ingersoll-Sergeant Drill Co.,
Gentlemen:—We bought two years ago one of the largest size of the straight line type of Ingersoll-Sergeant Inlet Compressor.

This was found to be too small for our needs, so we sold it to you and you purchased it from us.

This was set in place in our shaft to use in the Crystal Creek District, 10,000 feet above the level of the sea, and has been running continuously ever since, about times over ten years.

The steam cylinders were connected to an Independent Jet Condenser, for which we are using the mine water, and the resultant economy of operation is very noticeable.

The operation of this Compressor is as near perfect as that of any machine we have ever seen, and this type is well worth the extra cost on account of the great permanent economy in operation.

The Inlet pump exclusively with the Inlet Compressor we have only the Inlet pump to pay the extra rent.

Yours very truly, The Portland Gold Mining Co., Jas. A. Burn, President

INCORPORATED MINES PAYING DIVIDENDS.

NAME OF MINES	LOCATION	No. of Shares	Capital Stock	Par Value	Amount of last Dividend	Date of Last Dividend	Total Amount Paid in Dividends	Kind of Minerals Produced
1 Aetna Cons.	California	100,000	\$ 500,000	\$ 5	\$ 10	Apr 1890	\$ 170,000	G.
2 Alaska, Treadwell	Alaska	200,000	5,000,000	25	37½	Apr 1890	1,075,000	G.
3 Alaska Mexican	Alaska	200,000	1,000,000	5	10	Apr 1890	55,000	G.
4 Alice	Montana	409,000	10,000,000	25	05	April 1890	1,075,000	G., S., L.
5 Anaconda	Montana	1,200,000	30,000,000	25	1 25	May 1890	970,000	G.
6 Anchorage Island	Colorado	600,000	600,000	1	03	Apr 1890	198,000	G.
7 American Gold	Colorado	300,000	3,000,000	10	00	Mar 1890	97,000	G., S.
8 Associated	Colorado	1,250,000	1,250,000	1	01	Dec 1890	72,000	G.
9 Bald Butte	Montana	250,000	250,000	1	08	Mar 1890	679,818	G., C., S.
10 Big Six	Colorado	500,000	500,000	1	00½	May 1890	1,000	G., S.
11 Boston & California	California	800,000	600,000	1	06	March 1890	38,000	G.
12 Boston au Colorado Smelting	Colorado	15,000	750,000	50	5 00	April 1890	175,000	G., C., S.
13 Boston & Montana	Montana	150,000	3,750,000	25	6 00	May 1890	10,175,000	G., C., S.
14 Breeco	Colorado	200,000	6,000,000	25	05	June 1890	50,000	I.
15 Bullion Beck and Champion	Utah	100,000	1,000,000	10	10	Apr 1890	2,058,100	G., S.
16 Bunker Hill and Sullivan	Idaho	300,000	3,000,000	10	07	Apr 1890	648,000	S., L.
17 Cariboo	British Col.	50,000	800,000	1	01½	Feb 1890	24,905	G.
18 Calumet & Hecla	Michigan	10,000	2,500,000	25	10 00	Mar 1890	60,000	G.
19 Centennial Eureka	Utah	30,000	1,500,000	50	50	Apr 1890	20,000	S., I.
20 Central Lead	Missouri	10,000	1,000,000	100	50	May 1890	10,000	I.
21 Champion	California	34,000	340,000	10	25	April 1890	298,200	G.
22 Charleston	S. Carolina	10,000	1,000,000	100	1 50	Dec 1890	180,000	G.
23 Colorado Smelting	Montana	100,000	1,000,000	10	1 00	Jan 1890	1,915,000	G., S., C.
24 Consolidated Tiger and Poorman	Idaho	1,000,000	1,000,000	1	02	Dec 1890	50,000	G., S.
25 Creston Leasing	Colorado	1,000,000	1,000,000	1	01	Dec 1890	51,000	G.
26 Crowned King	Arizona	800,000	6,000,000	10	02	Dec 1890	232,000	G., S., L.
27 Doe Run	Missouri	5,000	500,000	100	50	May 1890	72,000	I.
28 Elkton Consolidated	Colorado	1,250,000	1,250,000	1	01½	Nov 1890	656,961	G., S.
29 Empire State	Idaho	75,000	750,000	10	20	May 1890	146,251	G.
30 Enterprise	Colorado	500,000	500,000	1	05	Sept 1890	90,000	S., L.
31 Ferris-Hegarty	Wyoming	1,000,000	1,000,000	1	00½	Mar 1890	5,000	C., G., S.
32 Geyser-Marion	Utah	300,000	1,500,000	5	02	Sept 1890	90,000	G.
33 Gold Coin of Victor	Colorado	1,000,000	1,000,000	1	01	May 1890	20,000	G.
34 Gold King	Colorado	1,000,000	1,000,000	1	02	May 1890	10,000	G.
35 Golden Cycle	Colorado	200,000	1,000,000	5	02	May 1890	175,50	G.
36 Golden Reward	S. Dakota	1,000,000	1,000,000	15		Feb 1890	155,000	G.
37 Grand Central	Utah	250,000	250,000	1	15	May 1890	193,750	G., S., G., L.
38 Gwin	California	20,000	1,000,000	50	25	Apr 1890	85,500	G.
39 Highland	S. Dakota	100,000	10,000,000	100	20	May 1890	3,884,718	G.
40 Holy Terror	S. Dakota	300,000	300,000	1	01	Mar 1890	122,000	G.
41 Homestake	S. Dakota	125,000	12,500,000	100	50	Apr 1890	74,411,250	G.
42 Horn Silver	Utah	400,000	10,000,000	25	05	April 1890	5,260,000	S., L.
43 Idaho	British Col.	500,000	600,000	1	05½	Jan 1890	292,000	G.
44 Iowa	Colorado	1,000,000	1,000,000	1	00½	June 1890	90,000	G.
45 Isabella	Colorado	2,250,000	2,250,000	1	06	Feb 1890	405,000	G.
46 Jack Pot	Colorado	1,000,000	1,000,000	1	02½	Mar 1890	25,000	G.
47 Jersey Leasing	Colorado	200,000	200,000	1	03½	Oct 1890	137,875	G.
48 Lake Superior Iron	Michigan	84,000	2,100,000	25	1 00	Feb 1890	736,000	I.
49 Le Roi	British Col.	500,000	2,500,000	5	10	Apr 1890	775,000	G.
50 Lille	Colorado	1,000,000	1,000,000	1	05	Apr 1890	215,360	G.
51 Minnesota	Minnesota	185,000	16,500,000	100	1 50	Oct 1890	4,735,000	I.
52 Modoc	Colorado	500,000	500,000	1	02	May 1890	130,000	G.
53 Montana Ltd.	Montana	860,000	3,800,000	5	12	Apr 1890	2,997,557	G., S.
54 Montana Ore Purchasing	Montana	40,000	1,000,000	25	1 00	Apr 1890	1,040,000	G.
55 Morning Star	California	2,400	240,000	100	2 50	Apr 1890	720,600	G.
56 Mt. Rosa	Colorado	1,000,000	1,000,000	1	02	Jan 1890	60,000	G.
57 Mercur	Utah	200,000	5,000,000	25	12½	Jan 1890	1,286,000	G.
58 Mammoth	Utah	400,000	10,000,000	25	05	Dec 1890	1,350,000	G., S., C., L.
59 Mata	Colorado	1,000,000	1,000,000	1	02½	Dec 1890	25,000	G.
60 Mead	California	2,000,000	2,000,000	1	20	Mar 1890	100,000	G.
61 Montreal	Colorado	1,000,000	1,000,000	1	01	Nov 1890	7,500	G.
62 Monument	Colorado	800,000	300,000	1	01	Dec 1890	12,624	G.
63 Moulton	Montana	400,000	2,000,000	5	05	Feb 1890	480,000	G.
64 Moon Anchor Gold	Colorado	600,000	600,000	1	07½	Nov 1890	261,000	G.
65 Mountain Copper	California	250,000	6,250,000	25	62½	Sept 1890	93,750	G.
66 New York & Hon. Rosario	Central A.	150,000	1,500,000	10	10	May 1890	1,050,000	S., G.
67 Napa	California	100,000	700,000	7	20	Apr 1890	90,000	Q.
68 New Idria Quicksilver	California	100,000	500,000	5	20	Apr 1890	120,000	Q.
69 North Star	California	200,000	2,000,000	10	25	Apr 1890	550,000	G.
70 Ophir Hill	Utah	1,000	25,000	25	20 00	Dec 1890	20,000	G.
71 Osceola	Michigan	50,000	1,250,000	25	2 00	Dec 1890	2,552,500	C.
72 Parrot	Montana	230,000	2,300,000	10	30	Mar 1890	2,115,898	C.
73 Pennsylvania Consolidated	California	51,500	5,150,000	10	05	May 1890	64,525	G.
74 Pioneer	California	100,000	1,000,000	10	12½	Mar 1890	62,500	G.
75 Portland	Colorado	3,000,000	8,000,000	1	02	May 1890	2,137,080	G., S.
76 Plumbago	California	300,000	300,000	1	15	Jan 1890	45,000	G.
77 Quincy	Michigan	100,000	2,500,000	25	8 50	Feb 1890	10,470,000	C.
78 Republic Consolidated	Washington	3,000,000	3,000,000	1	01	April 1890	30,000	G.
79 Reducer-Cariboo	British Col.	1,030,000	1,000,000	1	01	April 1890	50,000	G.
80 Royal Consolidated	British Col.	2,500,000	2,500,000	1	01	Mar 1890	25,000	G.
81 Sacramento	Utah	1,000,000	5,000,000	5	00½	Apr 1890	82,000	G.
82 Small Hopes Consolidated	Colorado	250,000	5,000,000	20	10	Feb 1890	3,825,000	S.
83 South Swansea	Utah	150,000	150,000	1	05	April 1890	117,500	S., L.
84 Standard	California	200,000	20,000,000	100	10	May 1890	1,859,200	G., S.
85 St. Joseph	Missouri	30,000	3,000,000	10	1 60	Mar 1890	2,842,000	L.
86 Silver King	Utah	150,000	3,000,000	20	25	May 1890	2,075,000	S., L., G.
87 Smuggler	Colorado	1,000,000	1,000,000	1	01	Jan 1890	1,105,000	S., L., Z.
88 Swansea	Utah	101,000	500,000	5	05	May 1890	161,500	S., L.
89 Tamarack	Michigan	60,000	1,500,000	15	4 00	Dec 1890	5,570,000	C.
90 Tomboy	Colorado	200,000	2,000,000	10	25	Dec 1890	650,000	G.
91 Utah	Utah	100,000	1,000,000	10	02	Jan 1890	179,000	G.
92 Victor	Colorado	200,000	1,000,000	6	50	Dec 1890	1,15,000	G.
93 Vindicator	Colorado	1,500,000	1,500,000	1	05	Apr 1890	203,000	G.
94 War Eagle	British Col.	2,000,000	1,000,000	1	01½	May 1890	309,000	G.
95 Wolverine	Michigan	60,000	2,500,000	25	1 50	Apr 1890	150,000	C.
96 Yellow Aster	California	100,000	1,000,000	10	10	Apr 1890	178,780	G.

S. Silver; G. Gold;

L. Lead; C. Copper;

Q. Quicksilver; I. Iron;

Z. Zinc.

N. R.—Companies not listed have not paid a dividend for the last twelve months.

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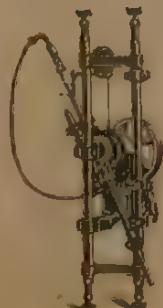
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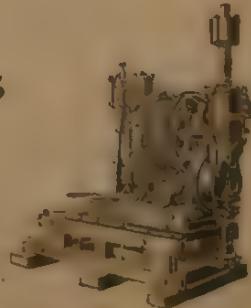
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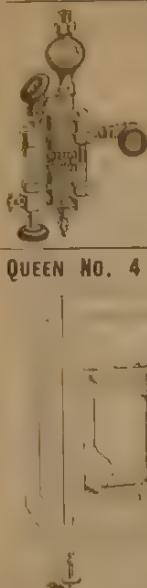
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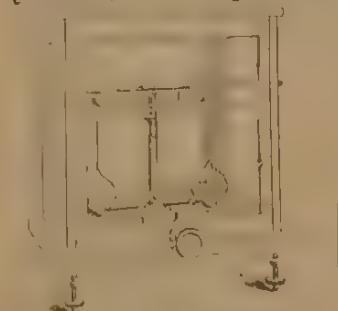
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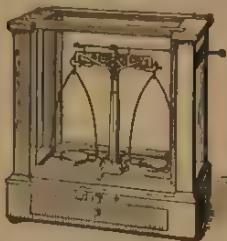
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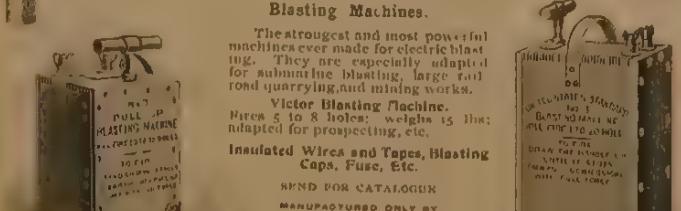
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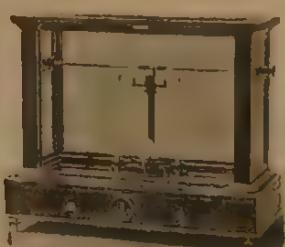
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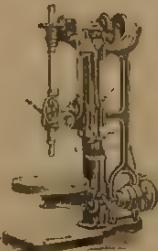
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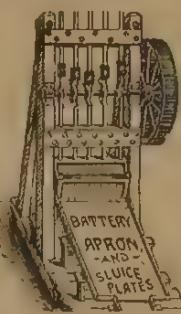


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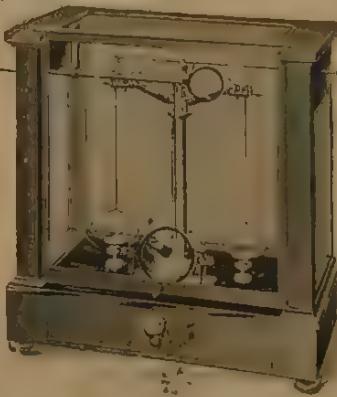
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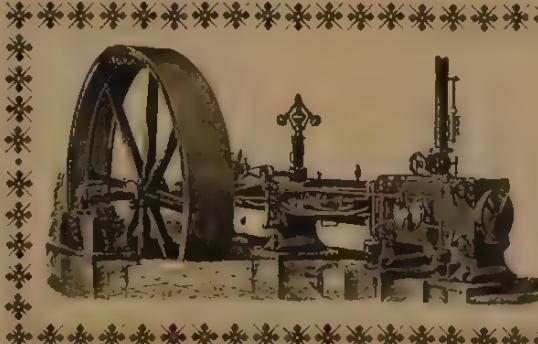
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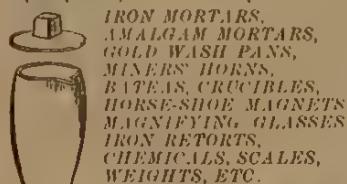
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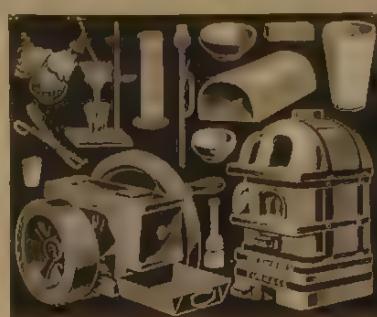
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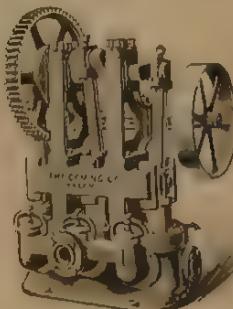
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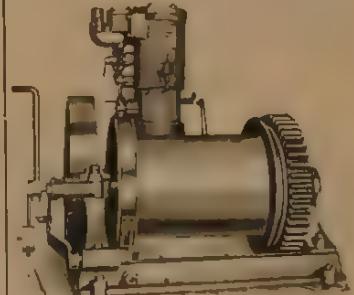
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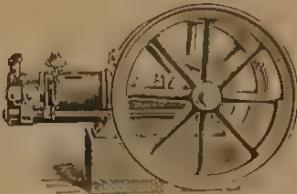
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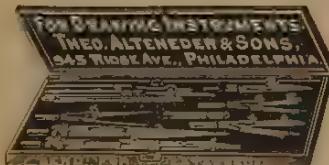
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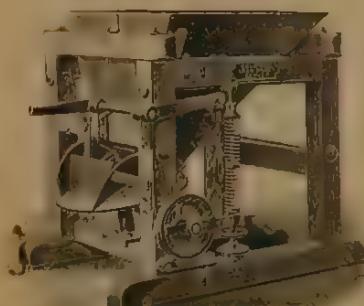
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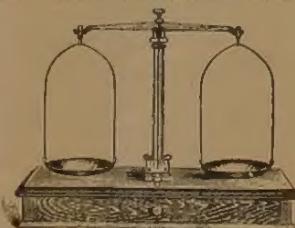
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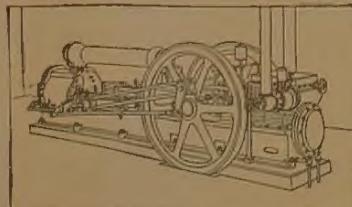
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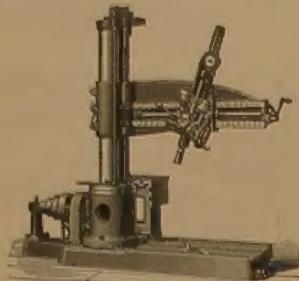
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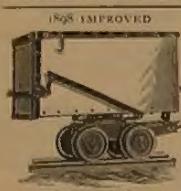
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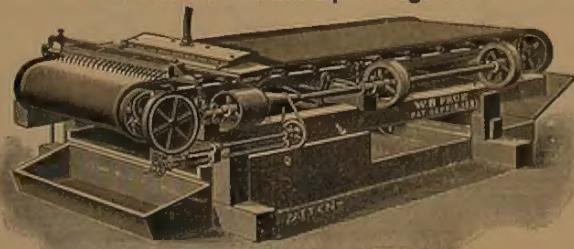
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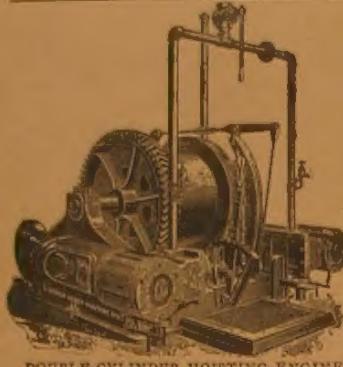
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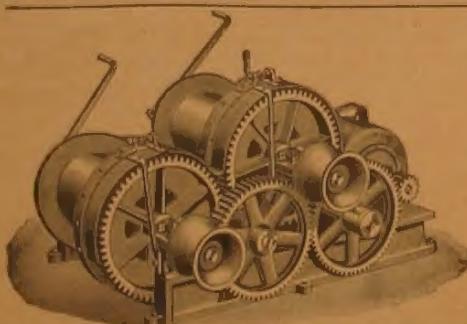
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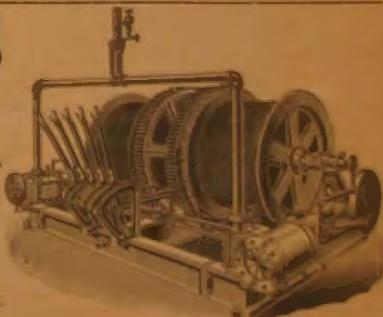
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